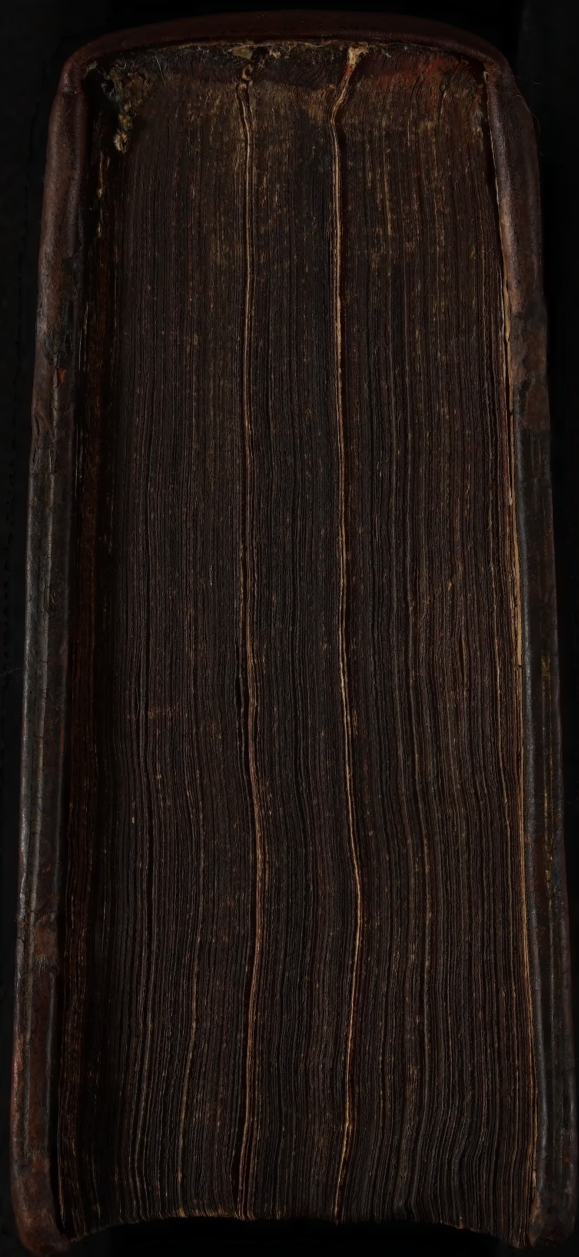


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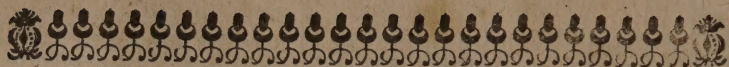




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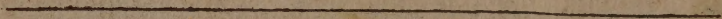
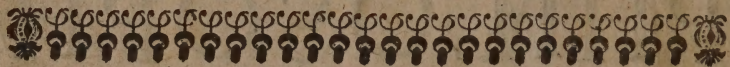
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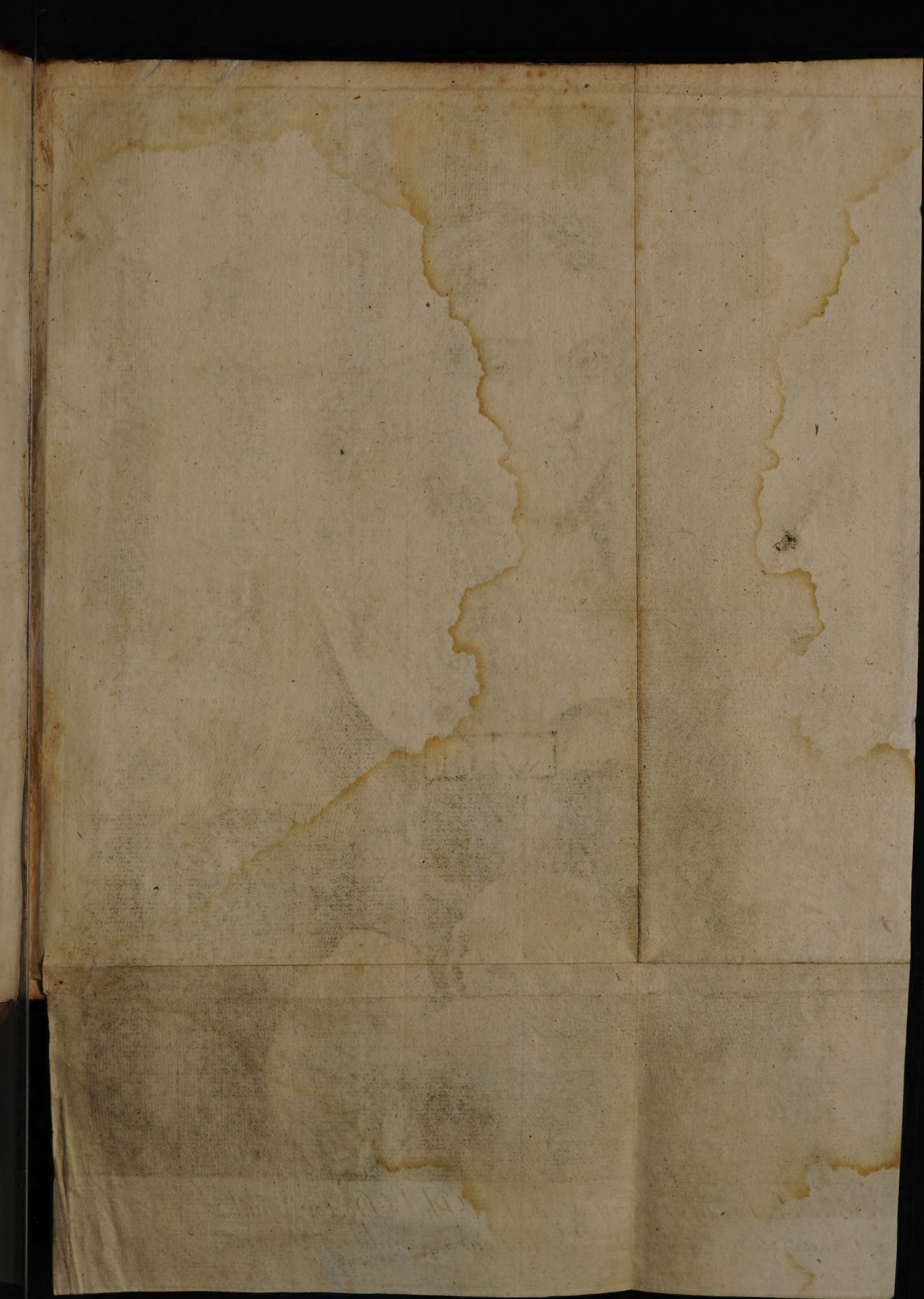


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practicus, et colleg. med. Hagiens. quondam Socius.

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Pierre Philippe sculp.

7

Archelogia Philosophica Nova,
OR
New Principles
OF
PHILOSOPHY.
CONTAINING

{ Philosophy *in general.*
{ Metaphysics, or *Ontology.*
{ Dynamilogy, or a *Discourse of Power.*
{ Religio Philosophi, or *Natural Theology.*
{ Physicks, or *Natural Philosophy.*

By GIDEON HARVEY,
Dr. of Phys. and Phil.
Late Physician to his Majesties Army in *Flanders.*

LONDON,
Printed by J. H. for Samuel Thomson at the Bishops-head
in S^t Pauls Church-yard. 1663.





To the Right Honourable

THOMAS

Earl of *Ossory*,

One of his Majesties most Honourable
Privy Council in the Kingdom of *Ireland*.

My Lord,



Although the interval of several years past might easily have blotted out the memory of any Obligations, yet it is the impression of your Lordships most obliging civilities conferred upon me, when fortune had blessed me with the honour of your good company in my Travels in France, that incites me to make the least recompence (yet the greatest within my power) of their remembrance and acknowledgement. But what can this add? Since Countries and Cities, that have been

The Epistle Dedicatory.

honoured with your abode, describe your fame with Characters of all perfections, concurring in a Person of so Noble, Prudent, Valiant, Heroick, and so Affable a Spirit: Whence I cannot but be confirmed of your Lordships Candour, that encourageth me in this my enterprize of offering to you a piece of Philosophy, so much below your acceptance; however questioning not but that your Honours endowments will raise the use of it (if any may be made) to the greatest height. And now being conscious of my presumption in aspiring to make choice of so eminent a Personage for a Patron, do humbly beg your Pardon, and the favour of subscribing my self

Most Noble Sir,

Your Honours most humble,

and obliged Servant,

HARVEY.



TO THE READER.

Reader,

I Was concerned in my mind, what to call you, courteous, or kind ; But since the Scene of this our Orb represents men moving so erratically, and varying in that extremity from the Ecliptick of a fixt Judgment, certainly I should have been frustrated in wooing your candour or gentleness ; dayly converse gives me the occasion of observing the variable Fates of Authors Works, which although indited by accurateness it self, and accomplished with Herculean labours, are oft termed *stufte* by some ; and to others again, the works of a Divinity scarce seem to surpass them : But to render Lines harmonical to every Ear is one of the humane Impossibilities ; and no small difficulty to a *divine* Pen. However all Volumns sail through an Ocean so terrible by Oricanes from Mens Tongues, the more by reason they are tossed to and fro without the conduct of their Pilot, yet it is not this

Charybdis

To the Reader.

Charybdis of a carping *Momus*, or that *Scylla* of a livid *Zotlus* shall prevail to keep these upon the stocks, but rather precipitate them upon a Voyage, with a venture of their whole lading full of Navelries, suspending my thoughts in the *interim* for a return: Not a recompence of vain glory, nor a reproof relished with contempt, neither being placed in one Scale of a ballance over powers the other containing no more than an empty air; And should not that be far short of my scope, marked with a single Character of truth, and advancement of Learning, setting aside any *divis ion*.

The faces of most things appearing yet clouded, many but partly unmask; as many, although of themselves clear, covered under a veil of dark terms and absurd notions of Philosophers, cannot but spur any sensible *Genius* to discuss that muddiness of some, and redeem the light of others, in the performing whereof I have here ingaged my self in these Treatises, taking what advantage long time, hard study, and laborious experiments would contribute thereunto. The only Instruments, that I have imployed in the sounding of the natures of beings, are the external senses, assuming nothing, or concluding no inference, without their advice and undoubted assent, whether in *Metaphysics Theology*, or *Natural Philosophy*. Those terms or notions, that only give a confuse testimony of their being to the understanding, escaping the evidence of external sense, we have declined as rocks, whereon any one might otherwise easily make shipwrack of his sensible knowledge. Wherefore whatever subject insisted upon within these narrow Pages, doth not crave a necessary, evident, plain and demonstrable assent, as being only attempted by external sense, mediately or immediately, my desire is the Reader would apprehend it to be no part of my Book. But to give you a more particular account of my design, I shall

shall first discover to you my intention in annexing Natural Theology: My thoughts fluctuating in a mist, astonished at the multiplicity of all kinds of bodies moving about me, advised to steer their course to some immovable, whereupon they might fix themselves, and thence to ponder upon others; here they certainly concluded one *universal immovable*, whereon and whereby all moveables are moved; because there can be no moveable, but must necessarily have its respect to an immovable, they being relations, which are constituted at the same time. My next assumption following the *chorea* of the first, and drawn from the relation interceding between an immovable and moveable, resolved me, that a Moveable must necessarily be derived from an Immoveable; whence I was soon confirmed of an universal Creator of the whole Universe: Thence I made a digression into the reason and cause of the creation of all moveables, particularly of my self, and so keeping strait on my Road, behold my steps, markt and digested in the fourth Book of my Philosophy, which by reason of their *prins* ought to have been ranckt in the front, all men naturally converting their first thoughts thither; but for orders sake have inserted them elsewhere.

Here I found the camp, whereon Atheism and natural Faith were to encounter each other; but the former being intrencht within the flesh, to have much the advantage of the latter standing bare upon so slippery a ground, whence it is, that the greatest part of the World, yea, of Christendom render themselves up captives and eternal slaves to the obedience of the devil, in the service of Atheism, engaged in actions of Abomination, Horreur, and Blasphemy. Notwithstanding since the ruines of those lines of Blessedness and Innocency, yet discernable in the souls of all men, are possible to be raised up again, whence they may easily demolish and batter down those strong

Bulworks of Pernicion, it is that part of *fortification* I have endeavoured to delineate, the knowledge whereof is absolutely necessary for Salvation, and is a Key wherewith to unlock the Mysteries of eternal happiness, revealed to us by the holy Scriptures, which being founded upon the greatest and truest reason, must certainly require a gradual ascent to it from natural Theology, being a rational discourse inferring Theorems of Salvation from Humane Reason, subordinate to the highest of the Scriptures. Wherefore all evidence doth direct us to make this our mark or circle, whence we are to run to that blessed Meta of the other. But how preposterous and rash is it for men to slip over this part, and to cast themselves without a bottom into the very depth of divine Theology? Alas their apprehension is immediately drowned in it; their understanding amazed at those fathomless pits of reason; in what different and monstrous acceptions do most Divines attach the genuine sense of Scripture, through ignorance of its precedents, scope, & dependance? And more than this, each invokes the Holy Ghost for a Witness for to attest those various Interpretations. But what is this, but their heavy dull imaginations hallucinating in the appearance of the Scriptures, like several eyes in apparent objects of the Sky, some framing this, others that likeness of them? I am not now to be confirmed in my belief, that the worst of Atheism is latent in many supposed Divines, their sinister ends, cheats, and vile secret passions of the flesh betraying their hypocrisy. Certainly, were I put to pick (out of any Profession) some that were to surmount all others in wickedness, I should not need long time to ponder upon my Verdict. The cause of this perversity I can state none but *presumption* in those, who after a twelve-moneths dosing upon *Ursin's Cat.* or *Ames. Medul.* do apprehend they should know

To the Reader.

know the whole drift and connection of the Fundamentals of Sacred Writings, which to the same appearing upon a reflection, differing, and strange in expressions, have soon confounded their small reliëts of natural faith into a detestable Atheism, however cloathed with a dissembled time-holiness under their dark habits for to feed their covetousness out of their Benefices. Had these but conferred with their innate Principles of Natural Theology, and arrived to the habit thereof before they had applied themselves to the top of inspired Learning, beyond all surmising, the Fundamentals of this latter would have been evidenced to them to be the alone absolute Wisdom, plain Truth, and most certain infallibility. Notwithstanding so universal a neglect of this part, yet I question not, but many may be found so well principled in both, that their undoubted Faith, expressed in their most Holy Life and Actions, will prove a great happiness to their Followers and Hearers in such Leaders and Teachers.

Next touching my Scope in the *Metaphysicks*, which was principally the substitution of such Theorems in them, as might be demonstrated by sense, and had their sole dependance upon it, in order to a confutation of those absurd Notions purely Logical, (although sold for real ones,) that *Aristotle* proposed in his *Metaphysicks*; in the interpretation and ambiguities whereof Schollars do usually consume a whole age in vain, reaping no better fruits thence, than that after seven years study they are enabled to say *Formaliter*, or *Materialiter* to every thing.

But lastly, my chiefest design ever since the seventeenth year of my age, when I had just finisht my course in Physick, and taken my last degree, consisted in elaborating such demonstrations in Natural Philosophy, as might serve to unfold the natures of Beings in relation to the Art of *Physick*, hitherto so uncertain, blind, and unfounded on

To the Reader.

Art, that I dare confidently assert, that the cure of many (if not of most) diseases is rather to be imputed to the strength of bodies, than the application of vulgar Remedies, as the precipitation of Patients to their extream Fate by the ordinary courses of Physick more than to the cruelty of their distempers, setting aside those frequent mistakes in discovering them and their causes; All which are so much subordinated to Natural Philosophy, that whatever rare Invention in Practice, or infallible distinction of any disease, is apprehended in the Art of *Medicine*, must be demonstrated by Principles of Physicks. Difficulties of Nature, that formerly seemed so uneasie to be explained, I find very obvious and evident through them; Many things that have hitherto lain hidden in the Bosome of Nature, and such, as no Philosophy could yet discover, you will meet with here. Besides these you are like to read the quotation of a *Book of Souls* or *Psychelogia*, formerly intending its insertion in the Second Part of Philosophy: But since I apprehend my self to be much scanted of my time, and that this Volumn would swell up into too great a mole, I am compelled to omit the publishing of it, although it hath been long since ready for the Press. Before I take my leave of my Reader, I must not forget to crave your permission of using some kind of terms in my Books, which although somewhat alienated from their proper signification, yet can give you a reason of their figurative or tropical acceptation, such are *Catochization*, *Grove*, besides many others. I must also acquit my self to you of my default in such plain and unpolisht Lines, which I have made use of; Certainly, whoever is acquainted with Philosophy will know, that it is Philosophical so to write; neither, had I been ingaged in any other Subject, could I have gratified your expectation herein, since it was never my fortune to read

To the Reader.

read two sheets of any English Book in my life, or ever to have had the view of so much as the Title Leaf of an English Grammar. I have also varied in the Orthography both of spelling and pointing from the ordinary, and so the Printer hath varied from me; My own part herein I can easily protect, and so I may the Printers, since his unacquaintedness with the matter and hand-writing, and the dazzling of his eyes, (which a pair of Spectacles might easily have mended,) in the smallness of my Letters, hath set him upon the Lee shore of accurateness; however you may prevent the danger of some mistakes (although not of all, since I have not the opportunity of so much as casting a superficial eye over half this Volumn,) by directing your self to the *Errata*, which you will find set down at the end of each Book. In fine, not to detain you longer in preambles, I shall only commend to you one of Grave *Cato's* Distichs thus inverted,

*Non hos collaudes, nec eos culpaveris ipse,
Hoc faciant stulti, quos gloria vexat inanis.*

Condemn thou none, neither give them praise,
Let fools do so, who love peoples gaze.

And advise you to suspend your Verdict upon these Writings, untill you have perused them twice, and then if disrelishing, dishering, false or contradicting to give your self the trouble of letting me know my errors in the sense of them, which, since my only scope is to promote Learning, to be taught my self, and to excite others to the study of things, that are yet imprisoned in darkness, I shall take for a very friendly office, not valuing the hearing or acknowledging my mistakes (although attended as usually with some reproof) provided, that at the same time I may be furnished with

To the Reader.

with better Principles in lieu of mine, or otherwise I shall think it much below me to take notice of such Scripts, intended for nothing more than Libels: Moreover, that my further duty may not prove a regret to me, the answering of such desires in Latine will oblige me to remain,

Courteous Reader,

Your humble Servant.

To Momus.

THou cross-grain'd Mome, 'tis time forbear to squint,
If not, I'll coin and cast thee in the Mint;
Bodel be stamp a dog gnorring at a bone,
More stupid, more dull than any dunghill stone;
If now thou shouldst grow civil, beyond what I can
Hope, then thou art no more a beast, but a true man.

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Philosophy in general.

The FIRST PART.

The first Book.

CHAP. I.

Of matters preceding and following the nature of Philosophy.

1. *The derivation of Philosophy.*
2. *What it was first called, and why its name was changed.*
3. *The original of Philosophy. The first Inventers of it.*
4. *What dispositions are required in a Philosopher. The difficulty in attaining to Philosophy. The pleasure arising from the possession of it.*
5. *The esteem and worth of Philosophy and Philosophers.*
6. *The use and fruits reaped from Philosophy, and redounding in General to every one: in Particular, to a Divine, Civilian, and Physician.*

I. **P**HILOSOPHY is a word of a mixt signification, and thereby soundeth *Love to Wisdom*, both which being implied in its composition out of *philos* or *φίλος* Love, and *σοφία* *Wisdom*.

II. This name was politickly framed by *Pythagoras*, to cover the genuine and first denomination of *σοφία*, and to hide its secrecy

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and excellence, the fame of which did attract so numerous a body of Contenders (who being ambitious to be renowned by the possession of it, before they had scarce made their first attempt, abusively stiled themselves (*σοφοι*) Wise-men) that through their multitude, they overclouded a few others, who might justly have challenged their title from it.

Since then this new imposed word implied but little Fame or Worth, the greater part soon deserted it, whose eager pursuit being more after the shadow, than the thing it self, they freely resigned both to the real deservers thereof.

III. Knowing nothing more certain, than that all, which we do enjoy, redounds to us by inheritance, we cannot doubt, but that Philosophy was also a *Relist* of the Forefathers, successively conveyed to us, who did attribute the original acquisition of it to the first man *Adam*: for he in his primitive and incorrupt state, being adorned with a full and perfect Knowledge of all Beings, it is probable, that after his Fall, he retained a measure of the same Knowledge; which, although being different from the former in perfection, yet by his industry had much promoted it, and so having committed it to the further accomplishment of his antediluvian Successors, to wit, *Seth, Enos, Cainan, Malaleel, Jared, Enoch, Methusalem* and *Noe*; it did attract such increase and degree of perfection from their experience, that we have no great cause to admire, whence the profound Learning of the postdiluvian Fathers did arise to them; who were either sacred, as *Abraham, Moses, Solomon, &c.* or prophane, as the *Magicians* among the *Persians*, the *Chaldeans* of *Babylon*, *Brachmans* in *India*, the *Priests* of *Egypt*, the *Talmudists* and *Cabbalists* among the *Jews*, the *Druids* among the ancient *Britains* and *Gauls*, with whom many of the famous Poets, *Homer, Hesiod*, as also the seven wise men of *Greece* were coetaneous; after which, *Pythagoras* flourished, who lived much about the time of *Nebuchadnezzar*, and spread his Doctrine throughout *Italy*, whence it was soon propagated through most parts of the world, and yet is over all the *East-Indies*.

IV. As there was an apt capacity required in these lovers of wisdom to receive the Discipline of their Masters, so there was also necessary in them an indefatigable study, to add to the Inventions of their Predecessors, which to cherish and excite, they proposed the greatest pleasure and contentment of mind, thence undoubted-

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ly resulting to themselves (according to that trite Saying, *Arduum quod pulchrum*, That which is lovely, is hard to be attained unto) which did abundantly satisfie their labours. This is verified by the Relation, which the Mathematicians give of *Archimedes*, who was so much enamour'd with his Speculations, that at those times which most did dedicate to the rest of their minds, and intermission from their Studies, he was most busied in his thoughts; insomuch, that when for his healths sake, anoynting his body with Oyl (which was an ordinary Preservative in those dayes) he used to make Geometrical Figures with it upon his Breast, and other parts of his body, that so he might avoid the depriving of his Soul from one moments happiness, when he was inevitably forced to consult the safety of his Body. At another time sitting in a Bath, he observed the water to be much swelled through his immersion in it, collected thence a way, whereby to find a proportion of Silver to Gold, when both united in one Mass. This Contemplation did profuse such a joy in him, that he brake out into these words (*Inveni, Inveni,*) I have found, I have found: No less effect will it produce in us, when finding that in our nebulous state of Ignorance, which we lost in our perfect state of Knowledge, by falling from our Integrity. This seemeth incredible, unless attempted by the serious and diligent application of our minds to it.

V. The Scales, whereby to weigh the worth of a thing, are frequently judged to be the Subject, wherein it is inherent, or the possessors of it, whose worth found, is the production of the worth of the thing proposed. The assent of this doth infer Philosophy to be the worthiest and most transcendent of all: For Kings and Princes, whose worth is not to be parallel'd to any but to themselves, have affected Philosophy, and preferred its worth above the esteem of all others. *David* and *Solomon* the greatest of Kings, extolled the Pleasure and Contentment flowing from their Contemplations, above them of Glory and Honour, and other secular Pleasures, which they enjoyed in greater measure, than any before or since. *Ptolomy Philadelphus* King of *Africa*, having weighed Triumphs, or the Glories following Conquests and Victories (which in their splendor do overtop all other kinds of Glories, and are reputed among the greatest of Contentments and Joyes) judged them to be more troublesome than pleasing: For he had observed them to have been attendants in their highest eminence to his late Prede-

cessors *Alexander the Great*, and *Ptolemy Lagns* his Father, and that their Contentments and Joyes (supposed to flow thence) were subject to a continual Eclipse, through their immoderate aspiring to greater, and through every Alarum of an Enemy, and through the daily News of their revolting Subjects (although but lately vanquished) discomposing their Spirits: Wherefore he composed himself to a peace, and applied his mind to the study of Philosophy, which did so much cultivate his understanding, and please his thoughts, that he endeavoured to procure the helps of men most Renowned far and near, by an universal Invitation.

VI. A man naked and unpolisht doth more resemble a Brute, than himself: What Proprieties are there in wild Beasts, but which you may find in *West-Indians*? I mean, those which are called *ἄνθρωποφαγοί*, or Men-eaters: They slay and devour one another; the shadow of each of them is a terrour to the other; nothing begetteth tameness in them, unless it be the presence of a Male with a Female, which the Instinct of Nature, and not their Reason, doth compel them unto. Nothing different from these should we be, were it not, that Philosophy did rectifie and reintegrate our Understandings: To this we owe our right Reasoning, Morality, and Knowledge of all Natural and Supernatural Beings; and without that we are nothing else but Ignorance and Barbarism.

Hence Ovid, Ingenuas didicisse fideliter artes, Emollit mores, nec sinit esse feros.

A Divine will hardly reach to Theologic Vertues, unless he be first endowed with Morals: Neither is he like to compass the Knowledge of God, unless he first admireth him in his Creatures, and natural beings.

Civilians (those who really merit that name) grow expert in composing Differences between others, by regulating Contentions arising between their own Soul and Body.

A Physician incurreth a suspicion of being a Mountebank, or Astrologick Impostor, in case he be not more than ordinarily versed in Natural Philosophy, and questionless will be frustrated in his Cures, unless he be exactly skilful in knowing the proportion of Animal, Mineral, and Vegetable Natures to the Nature of man, which is demonstratively treated of in Natural Philosophy. To this doth the great *Hippocrates* in his *Book of Elegance*, elegantly exhort his Auditors: *Διὸ δὲ μετὰ τὴν τὴν σοφίαν εἰς τὴν ἰατρικὴν, καὶ τὴν ἰατρικὴν εἰς τὴν σοφίαν. ἰατρὸς γὰρ φιλόσοφος, ἴσθις.* Wherefore we ought to apply Wisdom to the Art of Physick, and the Art of Physick again

to Wisdom: for a Physician, who is a Philosopher, is like unto God.

CHAP. II.

Of the Nature of Philosophy.

1. *Whether Philosophy can be defined.*
2. *Various Definitions of Philosophy. How Plato did define it. The Definition of Damascen.*
3. *The Authors Definition of it. That the Essence of God is as sensibly apprehended as the Essence of his Creatures.*
4. *What is implied by Knowledge.*
5. *The Subjectum circa quod, or Object of Philosophy.*
6. *The Subjectum Inhætionis, or Subject wherein Philosophy is inherent.*

Many perswade themselves, that Philosophy doth not admit a Definition, that requiring an Unity in the *Definitum*, or thing Defined, which is not inherent in the Nature of Philosophy, but rather a Multiplicity; wherefore it can only be described. To the contrary, all Beings have an Unity: for (*Eus & unum conveniuntur*) a Being and One are identified: so that, whatever hath no unity, is no Being: But they granting Philosophy to be a Being, cannot deny it an Unity: and if it hath an unity, it is definible. A Being may be *materially* manifold, and yet *formally* one, and of that nature is Philosophy.

Philosophy is a knowledge of Beings by their Causes, which is the *Modus considerandi*, or *Ratio formalis* of it, to wit, of Philosophy: But this is one. Beings, as they are the *Materia*, are many; nevertheless their universal *Form* in Philosophy is but one, which is to be known by their Causes.

II. The Definitions of Philosophy are variously propounded by several Authors, who disagree more in terms and words, than in the thing it self. Others again, who seeming to define the Essence of a thing, rather describe it by its Properties and Effects: some of which serving to illustrate its Nature, I shall not think amiss to produce,

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Among these, that of *Plato* is most cried up. *Φιλοσοφία ἐστὶ μελέτη τῆ θανάτου*. Philosophy is a Meditation upon death. This Meditation upon death; is that which goeth under the notion of a *Platonick Extasie*, which is nothing else, but a qualification requisite in a Philosopher, whereby he doth withdraw his thoughts from singular and material things, applying them to universal and immaterial beings: or whereby he inclineth his Reason to his Fancy, and diverteth his Mind from his senses: So that in this Rapture, a Philosopher hath his eyes open, and seeth not, and may be environed with Noyse, and hear not.

Another Definition the said Divine Philosopher recommends, approaching somewhat nearer to its Essence. Philosophy is a likeness to God, in as much as it is possible for a man to be like to God. God is a Pattern to man in his actions according to the greatest perfection of vertue, and in speculation or knowledge of all natural and supernatural Beings, the habitual imitation of which is the true Philosophy.

Damascen in his Dialect, Chap. 3. states this following Definition, *Φιλοσοφία ἐστὶ τέχνη τεχνῶν, καὶ ἐπιστήμη ἐπιστημῶν, καὶ ἀρχὴ πάντων τέχνης*, Philosophy is the Art of Arts, and the Science of Sciences, and the beginning of all Arts; all which amounts to this: Philosophy is a comprehension of all Arts and Sciences.

III. Philosophy is the knowledge of all cognoscible Beings. By Knowledge, understand a Habit of knowing a thing by its Definition or Essence, that is, by its internal and external Causes; namely, Matter, Form, and Efficient. By internal Cause, I intend a Principle through which a Being is constituted. Some beings having only a single internal Cause, as God and Angels are constituted by their Forms* without Matter, and for that reason are nominated Immaterial. Others are constituted through a double internal Principle, and from an efficient Cause; as all Natural Beings. Some obtain a single internal Principle, and one efficient Cause; as Angels. God only consisteth of a single internal Principle, which is his Form, which is that which he is: Hence God declares himself, *I am who I am*. Here may be offered an Objection, That God cannot be known by the same *Ratio Formalis cognoscendi*, as Naturals are, since that these are considered in a distinct manner in their Matter and Form, the existence of which is incurrent into our Senses: Wherefore the Essences of these we may perfectly apprehend.

* Take form in a large sense, as it doth imply an Essence or entire Being.

prehend. On the other side, God is not known to us, unless indistinctly, and by his Attributes, not by his Essentials. My Answer to this, is, That our Knowledge of God is no less distinct, evident, and sensible (I term it sensible, because according to the Dogmatical Institutions of *Aristotle*, the Root and Evidence of our Knowledge is, and floweth from our Senses) than of Naturals: and to speak truth, we neither understand certainly the Essence of God, nor of his Creatures, only their Existences, and other Accidents and Modes, under which the *Peripateticks* imagine the Essentials of a Being to be latent: So that only the *έν*, and not the *δύν*, doth appear unto us. Whence my Inference is, that the *Ratio Formalis* of knowing immaterial and material Beings is the same, whereby we know the Essences of both in an equal manner. We doubt no less of the Being of God, than of the Being of his Creatures; because as we know these to have a Being and Essence by their sensible operations and effects (For *Omne quod est, est propter operationem*; All which is, or hath a being, is or hath it for an Operation) so we are also certain of the being and Essence of God by his Operation and Effects upon our Senses. We know that a material Substance consisteth of Matter, because we apprehend a trinal dimension of parts in it, which is an Accident concomitant to Matter, or rather Matter it self. We are also sensible of a Form inhering in that Matter through its Qualities and distinct moving. We gather from Experience, that (*Nihil fit a seipso*) no material Essence receiveth a Being from it self; but from an Efficient. By which three Causes a Natural Being is generated, and from them derives its Definition. In like manner do our Senses declare to us, that God's Nature is immaterial: For we cannot perceive a trinal dimension of Parts in him, only that he consisteth of a pure, single and formal Being, because we cannot but perceive his formal and spiritual Operations, and Effects upon all material Beings. Wherefore the Knowledge of God proveth no less evident to us, and in the same degree and manner of Perfection, then of Elementary and Created Substances.

IV. Knowledge in the forementioned Definition doth equally imply a Practick and Theoretick Knowledge, the ground of which Division is founded upon the Matter and not the Form of Philosophy: so that according to the same sense, the understanding is called either Practick or Theoretick; not *formally*, as if the Understanding

standing were twofold in man, but because it apprehendeth an object according to its double Representation of being Practical or Theoretical.

V. *Subiectum circa quod*, or Object of Philosophy, are all Beings comprehending real and objective Beings, Essences, and their Modes, which latter are not specifically distinct from the former; but identificated, and considered here as real, notwithstanding partaking of a Modal Distinction; wherefore it makes no Formal Distinction in this universal Knowledge. In the like manner are the (*Phænomena*) appearances in Astronomy supposed and taken for real, and move the understanding as distinctly, as if they were real Beings, strictly so termed, otherwise they could not be referred to a Science.

VI. The *Subiectum in hæsonis*, or Subject wherein Philosophy is inherent, is the Understanding. The Understanding is either Divine, Angelical, Humane or Diabolical. In God Philosophy is Archetypick; in Angels and Men Ectypick; in Devils neither, they apprehending and discerning all things depravately and erroneously.

CHAP. III.

Of Philosophers.

1. *What a Philosopher is. Four Properties necessary in a Philosopher, That nothing is more hateful, and noysom than a man but half Learned.*
2. *The first Universities. The Rise and Number of Sects sprung from these Universities. The Fame of Socrates.*
3. *What Meanes Philosophers made use of to procure themselves a Repute and Fame.*

I. **A** Philosopher, or a Wise man, is a great Artist, and all-knowing: He is an Artist, in that he can direct all his Actions to a good and true end: and All-knowing, since there is nothing existent, but which he may know definitely. Wherefore *σοφία* is well derived from *σαφής*, clear; because a Philosopher understandeth all things clearly, which condition makes up one of the three

three Proprieties of a Philosopher, which are, 1. To know all things. 2. To have a capacity of teaching all which he knoweth. 3. To teach and divulge his Knowledge liberally (not for Loan, which is mercenary, and not suiting with the Dignity of a Philosopher) and freely.

Scire tuum nihil est, nisi te scire hoc sciat alter.

Alas thy Knowledge is scarce worth a Pin,
If thou keep secret what thou hast within.

Hence flow these trite Sayings, *Libere Philosophandum. Amicus Socrates, Amicus Plato, sed magis Amica Veritas. Non est jurandum in verba Magistri.* We are to deliver Philosophy freely, that is, with a *Socratick* Liberty, or without adhering strictly to Authorities of Wise men, since that all men are subject to Errours, and the contrary of many of their Assertions are found to be true, we have cause enough to doubt of all, which they have commended to our Studies, and not to be tied, as if by Oath and Slavery, to believe our Masters words in every Tittle: an Abuse equal to Popery, enjoyning all men, upon danger of their Soules perdition, not to question the least Sillable of the Dictates of their Priests. It is no less Error, to reject all which wise men have Published, their Works testifying their immense Parts and Abilities: So that our securest course is, to walk in the middle Path, and close with the Body of Philosophers in this Saying, *Socrates is my good Friend, Plato is my good Friend, but the Truth is my best Friend.* To which this doth also allude, *Plato is ancient, but the Truth is more ancient.* To these three, I will add a fourth; *Philosophandum est, sed paucis.* We are to prove our-selves Philosophers in short, or in few words. This was one of the Famous Precepts of *Ennius*, whereby he reprov'd those disturbers of Learning, who through the abundance of their futil Arguments, aery words, and tedious *Probo tibi's* might have rais'd anger in *Socrates* himself, which disposition to nugation and prattling you cannot miss of in a man, who is but half Learned, who generally hath depravate Conceptions of most things which he meets withal. Such are they, who strive to defend and propagate most absurd and pseudodox Tenents, many of which do secretly contain Atheism: As Assertions of the Pre-existence of Souls; Multiplicity of worlds; the Souls being *extraduce*, and infinite others, which necessarily are

Concomitants of these before-mentioned. In a word, *Homine semidocto quid iniquius* ? what is there more detestable and hateful, than a man but half Learned ? Which Apothegm may be justly transferred to a Physitian, *Medico semipерito quid mortalius* ? what is more mortal than a Physitian but half experienced ?

II. The first Schooles of Fame, or Universities, where Philosophy was publickly and orderly taught, were two : The *Italian* and *Ionick* Schooles. The *Italian* or rather the *Calabrian* School was most renowned for Mathematicks, and Ethicks, where *Pythagoras* was Professor. In the *Ionian* School Natural Philosophy and Astronomy were most professed by *Anaximander*, a Scholar of *Thales*. The *Italian* University encreased in fame by breeding of Renowned Disciples : as *Zeno*, *Democritus*, *Epicurus*, and others. *Anaximander's* School was no less advanced by the Succession of *Socrates*, the Prince of Philosophers, and as the Oracle of *Pythias* stiles him, ἀνδρῶν ἀ πάντων σοφώτατος σοφώτατος, *Socrates* of all men the wisest. And to give him his due, he was the Ocean of all Humane and Divine Learning, out of which scattered these four Sects : Of *Academicks*, *Cynicks*, *Peripateticks*, and *Stoicks* ; of whom may justly be pronounced, that whatever Truth they had retained in their Doctrine, it was derived from *Divine Socrates* ; whatever Falshood they taught, was from their own Innovation, and depravate Judgment. The *Academicks*, so called from their abode at the Academy or University, next succeeded the doleful loss of great *Socrates*, whereby they were exposed to the Innovations and erroneous Opinions of *Plato*, an elder Scholar of *Socrates*. *Plato* having finished his Course of Philosophy by an untimely Death, put also a Period to the Sect, which his Doctrine had raised and fomented, and moved many to withdraw from the University, giving their minds to wandering, and divulging their Opinions or Dogmatical Dictates in their Travels : Among which *Aristotle* was most taken notice of, whose Scholars, to wit, which he had begot in his wandering, were thence called *Peripateticks*, or Wanderers, which name his Scholars still retained, although most of them received their Learning from him after his settlement in *Lyceum*, a School not far distant from *Athens*, or according to other, in *Athens* : The Scholars of greatest Note bred in *Lyceum*, were *Theophrastus*, who succeeded *Aristotle*, and *Pyrrhon*, the first Author of the *Scepticks*. The *Cynicks* were so called from their Master *Cynofarges* ; whose Scholars were *Diogenes* the *Cynick*,

Cynick, and *Zeno*; whose Disciples afterwards were called *Stoicks*; his Doctrine was for the most part Moral. To these may be added two Sects more, which these late years have produced, to wit, the *Paracelsians* and *Cartesians*. The *Bombastin* Sect derived their Name from their Master, *Phil. Aur. Theophrast. Paracelsus, Bombast*, born at *Bohenheim*, an obscure place in *Germany*, whose Doctrine treated most of Natural Philosophy, innovated by Principles drawn from the Fire; hence he and his Followers are called (*Philosophi per Ignem*) Philosophers through the Fire. 2. The *Rotarians*, or *Cartesians*, a Sect of the latest standing, reaped their Discipline from *Ren. Des Cartes*, a *Frenchman*, whose Study was most Mathematical and Physicall, or rather a Mixture of a *Pythagorean* and *Democritean* Philosophy.

III. The principal Means which each of these *Grandeess* made use of to procure a Repute and Fame to themselves, were, Invections against their Masters Dictates, and phantastical Propositions of their own, dashed over with a multitude of apparent Reasons, and probable Arguments, wherein they did not only shew their Ingratitude and vain Ambition, but their Dishonesty to the world, by commending Falsehoods under the shape of apparent Truths, harnessed by their subtil Fallacies.

CHAP. IV.

Of the Distribution of Philosophy in Parts.

1. *In what manner Philosophy contains its subjected Parts.*
2. *How Objects move the Understanding by their first and immediate Representation.*
3. *That the Supreme and Immediate Division of Philosophy is in Practick and Theoretick Knowledge.*
4. *An Objection against the Subdivision of Practick and Theoretick Knowledge.*
5. *How Knowledge is subdivided.*
6. *That the Subdivision is adequate to all its Inferiour Parts.*
7. *Why Practick and Theoretick Philosophy are not treated of separately, as their Inferior Parts are.*
8. *That the Common Quadripartition of Philosophy is too strict.*

I. **P**hilosophy hath been defined, and considered as a *totum universalissimum*, comprehending all Sciences, and Arts, as a (*magis vel potius maxime universale*) more universal, or rather a most universal, containeth (*minus universalia*) less universals: or also, as in the manner of an (*totum Integrale*) entire integral Being, a Countrey consisteth of Cities, and Cities of Streets, and Streets of singular Houses, so is the entire Body of Philosophy constituted by its contained Parts.

II. The distinct Motion or Habit of an Object *sub ratione universalis formali*, to the Understanding specieth the kinds of Knowledge, an Object moves the Understanding (*ut primum movens*) through its first Motion in a twofold respect: 1. As it is good 2. As it is pleasant and admirable. As it is good, it excites a desire and appetite to it in the Intellect: For the understanding conceiving an Object to be good, in that it judgeth the Objects Convenience, and suitability to it self, and is naturally carried forth to that Object, by which natural motion wrought first upon the animal Spirits in the Phanſie, it moves the other Spirits lodging in Nerves throughout the Body, by drawing of them to that Object which it draweth it self unto; To which Attraction the other Spirits are naturally obedient, because they are a continuous Body, or joynd

joyned in continuity, and in the strongest coherence unto the first moving Spirits of the Phanſie; but of this more largely in its proper place. This motion of the Mind upon the Phanſie, is called the Will.

As it is pleasant and admirable, it moves the Understanding to its perſecution and Contemplation, in a double manner. 1. In a leſs univerſal, more concrete, and material manner, in which Representation it conſtitutes Phyſicks, or Natural Philoſophy. 2. In a more univerſal, abſtracted, and immaterial manner, which ſpecificeth Metaphyſicks.

III. Whence we may gather the ſupreme and immediate diviſion of Knowledge, as it is moſt univerſal, and is Philoſophy it ſelf, to be either Practick or Theoretick; becauſe Practick and Theoretick are the firſt and immediate Habits or Reſpects of Objects, whereby they move the underſtanding. Practick Knowledge is, whereby the underſtanding is determined to Practiſe. Practiſe (*πραξις*) denoteth the production either of a fluent or permanent work: The production of a fluent work is called by the general name of Practiſe: The production of a permanent work *ποιησις*, or the making of a work.

Theoretick Knowledge is, whereby the underſtanding is only moved to Contemplation, and is not determined to Practiſe.

IV. Againſt this partition of Knowledge may be Objected; that Practiſe is not the Object of the underſtanding, but of the will, which by all *Peripateticks* is affirmed to be materially diſtinct from the Underſtanding: Wherefore Knowledge being the Object of the underſtanding, is only ſpeculative, and in no wiſe practick. I grant the Premises, but deny the Syllogiſm, there being a *Fallacia conſequentiæ* hidden in it, or particularly there is more contained in the Concluſion, then was in the Premises. Wherefore I judge it ſtrange, that they ſhould really divide the Will from the underſtanding or Mind, which of its own nature is formally indiviſible: So that the forementioned Objection doth not conclude any thing againſt my Aſſertion, ſince it infers not the will and underſtanding to be diſtinguiſhed formally, but to differ only in matter, from which our diviſion is preſcinded.

V. Practick Knowledge is divided in Logick, Moral Philoſophy, and the Art of Nature, whereby ſhe is helped, and may otherwiſe be called the Art of Phyſick in a large ſence: Theſe tripartited

Parts

Parts being less universal, and less mediate, are drawn from a triple end or effect of Philosophy, determined by a triple Object.

1. The Soul. 2. The Body. 3. The Manners. The end of Philosophy upon the Soul is to help it in its Defect, consisting in its subjection to Errours, which constitutes Logick. The effect of Philosophy upon the Body is to relieve its Defects, consisting in nakedness, want of Conveniences, and subjection to Diseases. To this the Art of Physick prescribes Remedies and Helps. 3. The Effect of Philosophy upon the Manners (which are actions produced by Soul and Body joyned in unity) is to regulate them in their Extravagancies and Depravations, which specifieth Moral Philosophy: Note that Logick and Moral Philosophy are here taken in their largest signification.

Theoretick Knowledge is divided according to the universal formality (I mean Formality in respect to one another of the subdivided Members, and not to Philosophy itself, to which these are only material Subdivisions) of the speculative Object; which is threefold.

1. A Material Object inherent in material Essences, which limits it to Natural Philosophy. 2. An Immaterial Object depending from immaterial Beings, which determines it to Pneumatology. 3. An Object communicable to both, or abstracted from each, which is a Being in general as it is communicable to material and immaterial Objects, which constitutes the Subject of Metaphysics.

VI. All inferiour and less universal Knowledges must be comprehended in some one of the divided Members of Philosophy, otherwise it would be an erroneous Distribution: wherefore some of the Liberal Arts, as *Arithmetick*, *Grammar*, *Rhetorick*, are reduced to the Art of *Logick*, as it is taken in a large sense, implying a Habit of guiding Reason being defective in its Judgment, and in Elocution or Utterance. The Arts of *Musick*, *Geometry*, *Astrology* are comprehended in the Art of Nature, as also the Art of *Physick*, strictly so called, and the servile Arts, as the Art of *Husbandry*, of *Weaving*, of *Warring*, &c. Likewise are *Oeconomicks* and *Politicks* referred to Moral Philosophy; *Astronomy* to Natural Philosophy.

VII. The most universal parts of Philosophy, namely Theoretick and Practick, are treated of inclusively, as far as their Inferior Parts do contain them: So that thereby Authors save the labour of

of discoursing of them separately, and of repeating the same Matters in vain. Nevertheless was that Partition necessary, because through it Philosophy is contracted to its less universal Parts.

VIII. The common quadripartited distribution of Philosophy is too strict, the subjected Members exceeding its extension; for example, to what part of Philosophy will you reduce the Art of Medicine? possibly you may refer it to Natural Philosophy, which may not be, because the one is practick, and the other speculative. The like Question may be demanded concerning all the Servile and Liberal Arts: Wherefore it was requisite to add the Art of Nature to the practick Knowledges. Pneumatology hath been abusively treated of in Metaphysics, because its Object, namely, Spirits, is more contracted, than a Being in general; If you answer, that it is a part dividing a Being in general, and therefore it ought to be reduced to its whole; then by virtue of that Argument, Natural Philosophy ought to be referred to the same Science, because that is the other opposite dividing part; for a Being in Metaphysics is treated of, as it is abstracted from a Material and Immaterial Substance.

CHAP. V.

1. *What Method is requisite in the Ordering of the particular Treatises of the several Parts of Philosophy.*
2. *What Order is observed in the Placing of the General Parts of Philosophy.*

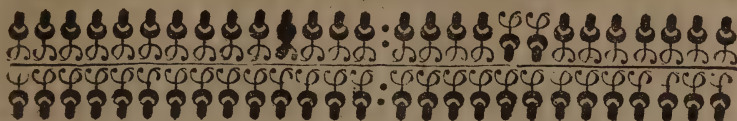
I. **T**He Method requisite in the Ordering of the particular Treatises of the several Parts of Philosophy is not indifferent, most preferring a *Synthetick* in Theoretick, and an *Analytick* Method in Practick Knowledges, all excluding an Arbitrary Method in matters necessary, and such are Philosophick.

II. The Order observed in the placing of the General Parts of Philosophy, is drawn from their Dignity, or primality of Existence. If from their Dignity, Pneumatology is the first, because of its most excellent Object. The next *Metaphysics*, because of its most general Object. Moral Philosophy is the first, in respect of time, because our Will is the first Faculty we exercise next after our Production,

duction, whose first act is, to incline a Child to suck, which being subject to be immoderate in it, is learned by use and direction of its Nurse, to be better regulated in its appetite, and to know the Rule of Temperance; Hence it is an universal saying, *Disciplina fuerunt prius in usu quam in arte*, Disciplines were in use before they were in art. The Will being the first, which required the help of Prudence, and Moral Philosophy, was the only cause which moved *Socrates* to teach Morals first, and not because the Science of *Physicks* were, or seemed to be obscure, and hard to be known: for even in them he was more skilful and learned than any ever was among the Heathens. The first in Nature and respect to Knowledge, is *Metaphysicks*, comprehending all the others in it self. The first *quoad nos*, is *Logick*, which doth dispose our understanding for the Discipline of the other parts.

Each of these Parts obtain a distinct consideration. *Metaphysicks* are considered as abstracted, and Immaterial, that is, most remote from Singulars; not properly immaterial, as a Spirit, but as inherent in its less universals, and by contraction may be material. *Physicks* are considered as a less universal, and nearest to Singulars, which by their common habit and Representation, exhibit a common unity, which constitutes a less universal: wherefore whatever cannot be proved by experience, that is, by our Senses, to be existent in Singulars, makes an Opinion, or Errour in the universals: So that the proof of *Pneumatology*, as well as of Natural Philosophy, depends from our Senses, and experience in Singulars. Wherefore every Philosopher ought to make probation of all Assertions, in whatever part of Philosophy it be, by Arguments drawn either mediately or immediately from Singulars, and especially in Natural Philosophy; which way of Arguing produceth a Certainty and Evidence or Demonstration.

The



Metaphysicks.

The Second Book.

CHAP. I.

Of the Nature of Metaphysicks.

1. *Of the Etymology and Synonima's of Metaphysicks.*
2. *The Authors Definition of Metaphysicks. That a Being is univocal to an objective and a real Being.*
3. *The true formal and adequate Object of Metaphysicks.*
4. *Wherein Metaphysicks differs from Philosophy.*

IT will be needless to propound any thing further concerning the antiquity, worth, and pleasure of the study of *Metaphysicks*, since you may justly apply the general fruits and ends of Philosophy to it in particular, wherefore I proceed to what is more requisite.

I. *Metaphysicks* was so called from its Etymology out of *μετά* above, and *φυσικῶς*, *Physicks*, which in composition imply as much as a knowledge above *Physicks*, and from its transcendence it appropriates to it self the most transcendent name of the whole, namely, Wisdom, or a universal Knowledge, which it retains, although improperly; because it is next compared in universality to Philosophy. It is called also the first Philosophy, from its nearest approximation to Philosophy,

osophy, its most proper Denomination is *Ontology*, or a Discourse of a Being.

Metaphysics is a Knowledge of a most universal Being. Knowledge imports the unfolding of a thing by its Causes, Effects, Properties and Affections. By a most universal Being understand, a Being abstracted from more universal, and mediately from less universal, material and immaterial Beings, prescinded from real (strictly so termed) and objective Beings, or from real and modal Beings, to all which a Being in general is a *Genus univocum*: For were they not univocal Parts of a Being in general, they could not be treated of (*per se*) in this Science, but *per accidens*, which is erroneous. But suppose I granted that modal or objective Beings had their places here *per accidens*, to what Science are they then referred *per se*? For as they are cognoscible, they come under the Notion of Philosophy, and have a distinct Unity and Essence, which must be considered *per se* in some part or other of Philosophy.

Since then they cannot be reduced *per se* to any Form else, their proper place must be here. I prove that a Being in general, as it is the Subject of *Metaphysics*, is a *Genus univocum* to an (*ens rationis*) Objective Being, and a (*Ens Reale*) real Being. All Beings are capable of being the Subject of Philosophy, so far as they are cognoscible only; not as they are real Essences, but as they really move the understanding to their knowledge: This is evident hence, (*Quicquid recipitur, recipitur per modum recipientis*.) because knowledge in the understanding ariseth from the knowledge in the senses; and the senses know objects by their distinct moving of the sensories; the understanding by being moved by the sensories; wherefore the understanding, which is the Subject of Philosophy, knoweth no things further, than it is moved by the internal and external senses.

A *Genus univocum* is, which is equally constituted by its *Species*; that is, at the same time, and in an equal manner. Univocal *Species* are, which constitute a *Genus* equally. This premised, I frame my Argument thus;

An objective Being, and a real Being do equally constitute an universal cognoscible Being. *Ergo*, they are univocal Parts. I confirm the Antecedent. An Objective Being doth as *really move the understanding, as a Real Being: *Ergo*, they are equally cognoscible Beings: So that an Objective Being is neither more or less a cognoscible being, than a Real being, and as to the understanding,

* By really
understand
effectively
& properly,

ing, they are formally one, differing only materially. If two different Essences were reduced to one Science, to wit, one *per se*, the other *per accidens*, they would constitute a formal difference in a Science, and cause a duplicity in it, which should be but one.

III. The Object of this Science is a Being, as it hath a cognoscible Essence; so that whatever hath no cognoscible being, is excluded without its denomination: Wherefore a *non ens reale* (excusing the Impropriety of speech) or that, which hath no real being or existence, may be cognoscible, provided it hath but an objective being*. But for a (*non ens objectivum*) a being, that hath no objective existence, that hath no being, and is impossible, neither can it any wise be positively considered.

* So a possible being, which is a *non ens reale* may be conceived to be an *ens rationis*.

IV. A Being here is conceived, as it is a most universal being, and abstracted from its more and less universals; herein it differeth from Philosophy, the formal Object of which is taken for a being as it is a most more and less universal being, prescinded from Practical and Theoretick beings, and treating of them in their most, more, and less universalities: whereas a being in *Metaphysics*, is also a most universal being, abstracted from more and less universals, but treating of it only, as it is most universal.

CHAP. II.

Of Precision.

1. *What Precision is.*
2. *That a real Precision is not properly a Precision.*
3. *That Precision constitutes a Positive and Negative.*
4. *The Difference of Precision. That all Precisions are formal.*

I. **P**recision is an operation of the mind, whereby in distinguishing the Parts of a being from one another, we do apprehend them, which really cannot exist asunder, as existing separately in our minds, in such a manner, as if they were really existent out of our understandings: For example, a singular Blackness in an *Ethiopian*, although it cannot exist really out of that *Ethiopian*, yet we may conceive that blackness by it self in our minds, and the *Ethio-*

pian by himself, as if they were really and separately existent.

II. Hence it followes, that properly there is no real Precision or Abstraction, as Authors generally have imagined; for that which was really distinct from another, is so (according to their Doctrine) without the operation of the understanding, and therefore it is no precision; because a precision is an operation of the mind. Where observe, that this precision superaddeth nothing to the (*Ratio formalis intelligendi*) to the understanding, but to the thing understood, or matter intelligible. Wherefore objective and modal beings are made equal objects to real beings by the forementioned precision, and move the understanding as properly as real beings.

III. A Precision constitutes a Positive and a Negative: A positive unity, and a negative distinction. That same unity is not a *non ens*: wherefore the Negative, which is concomitant to all precisions, is not understood by us, only we judge by experience, that one being hath but one unity, and spying a being, we judge, that that being hath unity, and therefore is not a *non ens*. The difference arising between two real beings or essences is *simpliciter* called a distinction: the difference between a real being, and its Mode, or Habit, or Representation, is a formal precision: So that all precisions are formal. I call it formal, because we give it a distinct Definition, which is the Form of a being: as in an *Aethiopian*, we precind his blackness from his Humanity, and define it a colour, which doth concentrate our sight; his Humanity to be a rational living substance. Which beings are formally distinct from one another, because they have distinct Definitions.

IV. A Formal precision is either really modal or objectively modal. A real modal precision is whereby an accident is precinded from a real Essence. An objective modal precision is, whereby an accident is abstracted from an objective being; an objective being is that, which doth not exist really, but in the mind only, although it is grounded upon a real being.

That, which is called a formal precision of beings in the understanding, is termed a real distinction in real beings, which are not distinguished from one another without the operation of the understanding, for it is our understanding perswades us that they are distinguished really from one another.

CHAP. III.

The Manner of Precision.

1. How a more universal Being is precinded from its less universal Beings.
2. How an universal Being is equally abstracted from an (*ens Rationis*) Objective Being, and (*ens reale*) a real Being.
3. How a common Concept is precinded from a Substance and Accident.

A Being in its greater universality is precinded from beings in their less universality; when we conceive a common representation to two or more less universalities, & apprehend them united in that commonness, and distinct from each less universal, from which it was abstracted; for example, an immaterial and material Being have each an Essence: in that, they have each an essence, they are like to another, and constitute a commonness, this commonness abstracted from each, and distinguished from their materiality and immateriality is the formal precision of a being in its greater universality.

The same Rule is also held in abstracting a common Concept from an (*ens rationis*) objective being, and a real being; each of them having a commonness in their essence, which is, in that they move the understanding, although one existeth really without the understanding, the other only in the active understanding: the abstracting of this commonness from the objectiveness, and reality constitutes a precinded unity of an *ens rationis*, and an *ens reale*.

In the like manner is a common concept precinded from an accident and substance, each of these having a commonness of moving the understanding, which abstracted from their realities, precindes a more universal unity from each. Note that the Doctrine of precision doth not properly belong to this place; which notwithstanding I thought good to insert, for to explain the specification of the Subject of *Metaphysics*; namely, how a being in its greater universality is abstracted from its lesser universalities: how it is univocal to an objective and real being; to a substantial and accidental

dental being; to a material and immaterial Essence; and summarily, how that a being preceded in the forementioned manners, and univocal to every one of them beings, is specified to the Subject of this Science.

CHAP. IV.

Of the Definition of a Being.

1. *What the proper name of the Nature of a Being is. The improbation of several Definitions of a Being.*
2. *Objections against the common Definition of a Being received by most late Philosophers.*
3. *That there is no common Concept to a possible real Being, and an actual real Being.*
4. *That there is an univocal Concept to all immaterial and material, Objective and Real, Substantial and Accidental Beings.*
5. *The Authors Definition of a Being. That our Knowledge is comparatively as perfect as Adams was.*

THE Quiddity of a Being in general goeth more by the name of the *Concept* of a Being, that is, as it is a conceived being, or as it is an Object of our Knowledge, than the Nature and Formality of a being; and that justly and properly, because a being is a being (as to us) only from being conceived by us, that is, from its cognoscibility. As the common name imposed upon the *Quiddity* of a Being is very proper, no less improper are the common Definitions of it, as they are rendred by most *Aristotelian* Commentators: Whereof some proposed this Definition: A Being is that, which is not nothing; or (according to others) which is no *Chimera*. The first is not so much as a Description, which is cognoscible, but nothing is not cognoscible *per se*, but *per aliud*, to wit, by a being; if so, then a being is apprehended by a no-Being, and a no-being by a being, which runs in a blind circle, like a Horse goes round in a Mill. The latter Definition is a Description of a Real Being, and is not freed from all Objections: 1. It is described by a Negative. 2. All that, which is no *Chimera*, is not a real being: for a *Hircoceros* is

no

no *Chimera*. But possibly by *Chimera* is meant an *ens rationis*, in a larger sense; which although granted, yet there are beings, which are neither strictly an objective being, neither in the same extent a real being; such are all modal beings, which are distinguished from a real being, as parts from their whole.

II. This Definition is more generally received by most latter Philosophers. A Being is, which hath an aptitude to exist; or to which existence is possible. This Definition is also involved in scruples and repugnances: for here a possible being is only described, and not an actual being; wherefore it is not a general Definition of a being. Others, to clear that Objection, proposed the same Definition with a Tayle to it. A Being is, which hath an aptitude to exist, or is that, which doth exist. This is a plain division of a being existent, and possible to exist; Where halts the Definition then? 2. Essence is nearer to a being than Existence; wherefore illegally defined. 3. That which hath an aptitude to exist, is no real being, because it hath no real Essence, nor cognoscibility from without. 4. It is too strict: for it doth not comprehend an objective being; wherefore we have occasion enough to doubt of the whole dispute of *Smiglecius De ente rationis*, since that he proceeds upon a Definition falsely supposed, and defined by existence, which is only a mode of a Being.

III. There is no common concept to a possible real being, and an actual real being; because the one is a Negative, the other a Positive, which being contrary, cannot constitute an unity, which is an effect of similitude, or commonness of Concept. A possible being is a Negative; because it is that, which is no real being in a strict sense: For real in a large sense, is taken, for whatever doth move the Understanding. Neither can I apprehend, how a possible being may be called real, according to the ordinary acception; which imports real to be that which doth exist without the understanding; wherefore that which doth not exist, but only can exist, is not real. And this is past mending, notwithstanding the enlarging of it thus. Real is that, which is, or can exist without the Understanding. To define two formal Natures in one Definition, is absurd. For that which is, is one Formality, that which is not, but supposed to be in the *Divine Idea*, is another Formality. That these two are Contraries, is evident: because that, which is, we may perceive by our senses, that, which is not, but can be, or is in the

Divine

Divine Idea, we can neither perceive by our senses, or understanding. Lastly, Possibility relates to Existence, and therefore (if granted) it would be but an accidental Definition, or rather a Division.

IV. That there is a common and univocal Concept of God, and his creatures, of accidents and substances, of objective and real being (*ex parte Actus*) in the understanding, is sufficiently proved, by supposing certainly, that God is as sensibly known by us, as his Creatures are, and consequently the Concept in the understanding may be univocal; that Accidents and Substances differ modally: And, that an Objective Being is as much a being to us, as a real being; all which hath been demonstratively proved in the precedent Chapters. Besides, the manner of Precision, which is the ground of an univocal Concept, I have so plainly and briefly set down in the two Chapters of Precision, that you have thence an easie entrance, to go through all the difficulties of *Metaphysics* (which arise from an omission of an exact Explication of Precision) and to understand with more ease the subtilities of *Suares*, *Arriaga* and *Oviedo*, than they can understand themselves, and dissolve all Objections against the univocal Concept of the forementioned beings.

V. A Being is that, which hath an Essence; not that which can have an Essence; for it hath none. To have an Essence, is to be existent; to be existent, is to have an Essence, which Reciprocation is not the same, that hapneth to *Synonyma's*, but to a Formality, and its propriety; so that existence is not really distinct from Essence, but only modally. An Essence is that, whereby a being is cognoscible to be that, which it is. Where observe, that as to us, cognoscibility is necessary and formal to a being; for a being, as to us, is no being, unless it be cognoscible. Notwithstanding this relative Essence, we do grant an absolute or fundamental Nature, whereon this relative Essence of a being is grounded.

That which man never perceived by his senses, or like to any thing, which hath been perceived by him, is no being, neither objective or real: This I prove; whatever we can say is real, can be perceived by our senses (or otherwise, how could we say it were real; for saying proceeds from our Knowledge, and our Knowledge from our Senses) and whatever is perceived by our senses, is real, that is, is existent from without. *Ergo*, There is no real thing, but it is perceptible by our Senses, mediately or immediately, and consequently as to us, is real from its cognoscibility. You may object, that

that there are many Beings existent, which an individual man cannot perceive : *Ergo*, by that they should not be real. I answer, That *Man* is taken here in the universal ; for the plurality of men, and therefore I added, *by our Senses* ; so that whatever man in general is not capable of knowing, it is a *non ens* ; for otherwise, if any thing should be said to be real, and no man could perceive it, or did ever perceive it, we should say a most palpable untruth, which another would reply unto, that it was no being : because no man ever saw any such thing, or did ever hear of it. 2. According to the Supposition of the Objector, the material beings, which we may imagine to be existent without the tenth or eleventh Orb, are real ; which all confess to be imaginary, and therefore not real. It is certain, that whatever is cognoscible to man, is a being ; but whether a being may not be something beyond what is cognoscible, is a doubt. 2. The *Subjectum in quo* of cognoscibility (*viz.* Man) is differing from himself now to what he was before his Fall, and therefore he apprehending a being then further and beyond what man doth apprehend it now, seems to alter the formality of a being, which should be inalterable : Yea, let us go on and question, whether Angels do not know a thing beyond what may be perceptible to man ? If they do, then beyond all Opinion, Cognoscibility in man is not the Formality of a being. To Answer to all these, we must state, that a being is that, for which it is known to be : For it is impossible to imagine, that a being should be any thing else, as to a Rational Creature, but what it may be apprehended by him to be ; supposing a man to know certainly what a Colour, Smell or any thing else is in it self, that thing, as to, or in that man, can be nothing but what he knowes it to be : or asking a man, what such a thing is, he will answer you, it is such a thing, that is, he apprehends it so to be. Again, Suppose an Angel told you, such a thing is such ; this is no otherwise, than that he knows it to be such or such. I might almost state the same Case of God, but fearing I should offend, I rather omit it. Supposing then that that, which is cognoscible to man, is a being, I do affirm, that an infinite being, as far as it is cognoscible to man, is a Being, and is perceived by him to be a Being ; but since that being is not terminated in mans Knowledge, he cannot out of consequence but think and believe, that that being is indeterminate, or at least is more than he knows or is capable of knowing, so that this is a very palpable ground to man, to induce him to believe (for

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know

know it he cannot, since it is beyond his Knowledge, and therefore must believe it, which is an assent beyond Knowledge) that God is a being, because he knows him to be a being, and that he is infinite, or indeterminate, because he is not terminated within his Knowledge, and because God declares the same of himself; wherefore it is well said, that we know God partly only, and as through a Glass. Herein is an infinite being distinguished, and we know it to be distinguished from a *non ens*, which is also (although improperly) termed Infinite, because we know a part of the former, but no part of the latter, and therefore we conclude the one to be something beyond what we know it to be, and the other to be nothing beyond what we know it not to be. Finite things, as far as they are cognoscible, are nothing beyond what they are cognoscible, and although one man may erre in his Knowledge, yet the universality of men, it is probable, do not, especially in immediately sensible Objects. In relation to the second doubt and Objection, I affirm, that man in his present state, cannot discern the Essence and Modes of a being so clearly at once, so swiftly, so certainly, and so easily as man did before his Fall, because of the depravate and contrary Habit, since befallen to man; nevertheless his Principle of Knowledge is the same, and may through it perceive, and know the same things, and in the same degree, although with subjection to Errour, Difficulty, by length of time, Study and Experience. Wherefore if *Adam* knew all things as they were. (as doubtless he did) and that cognoscibility of beings in him, were their formality, as to him, certainly the same cognoscibility must be their formality as to us. I could render this point much clearer, but this may suffice to an attentive mind, and therefore shall spend no more Time or Paper about it, deferring it until such time, which I may happily employ for the answering of such Objections, that probably others will make against it.

Hence we collect one member of the division of a Being, namely a Real being, which is that, which our understanding doth apprehend to exist without, in the same manner as it doth apprehend it within.

CHAP. V.

Of the Formality of an Objective Being.

1. *The Authors Definition of a (Ens Rationis) Being of the Mind, or an Objective Being. Wherein a Real Being differs and agrees with an Objective Being.*
2. *The Proof of the fore-given Definition. That whatever we think, when we do not think upon a Real Being, is an Objective Being. That whatever we think or can think, when we do not think upon a Real Being, is like to a Real Being.*
3. *Another Argument to prove the Formality of a mental being to consist in likeness to a Real Being.*
4. *The Division of an Objective Being.*

1. **T**hat, which a man doth apprehend to be like to what he perceives by his senses, is an (*Ens Rationis*) objective being, which is like to some one, or more real Beings. And this makes the other opposite dividing Member of a (*Ens*) Being in general. An *Ens Rationis* or an objective being, is that, whose essence existing in the mind only, consisteth in a likeness to a real being. That an Objective being as to us, is as much a being, as a real being, it appears hence, because a being, like to another being, is as much cognoscible in its existence, and other modes or Accidents, as a real being, to which it may be like. It is called objective, because its essence is immediately grounded upon the passive and active Intellect, which gives it to be objective or representing: So that you may observe, that the force of the word *objective*, doth confirm the truth of my Definition, which is, that an objective being is, which represents a real being, or is like to a real being. Likeness doth not imply a single or immediate *Idea* in the active Intellect; for that is only proper to real beings, but a reflexe or double *Idea*, or the framing of another *Idea*, like to the single *Idea* of a Real being.

A being conceived to be like to a real being, is partly different from it, and partly the same with it. It is the same with it, or identified in their superiour gender, which is a being. It is different

rent, in that it moves the passive understanding differently from a real being, that moving the understanding by its present motion through and from it self: whereas it self moveth the passive understanding through its intelligibility or internal cognoscibility, which it hath in the active Intellect. This *Intelligibility* is nothing else but the same *Idea* of a real being, conceived again in the absence of that real being, which made that first *Idea* by its own present motion in the understanding: In a word, it is not else, but a Recordation of a real being; and a real being it self is nothing else, but a being apt to move the senses by its own single and present Motion.

II. I prove the fore-stated Definition of an Objective being to be adequate to its Essentials. If whatever we think or can think, be only like to a Real being, and that at such times, when we are not employed in understanding a Real being, is no real being; that Concept must be of an *Ens Rationis*, or Objective being: But what ever we think, or can think, is like to a real being, and that, at such times when we are not employed in understanding a real being, is no real being; *Ergo*, whatever we think, or can think to be like to a real being, and that at such times when we are not employed in understanding a real being, must be a Concept of an *Ens Rationis*, or Objective being. I confirm the *Major* Proposition, which contains an Argument *a necessario*. The Necessity flows from a Maxime, which is that an Objective Being and real being are contradictorily opposite; and between Contradictories there is no Mean or *Medium*. But of this more hereafter.

I prove the *Minor*, which is, that all which we think, or can think is like to a real being, at such times when we are not employed in understanding a real being. Stop your ears, and shut your eyes, or compose your self to a *Platonick* Extasie, and try, whether you can think of one or more beings, which is, or are not like to a real being or beings; let that thought be of a being most impossible to exist really. I am certain, I could never. You will say, that you can think of an *Atlas*, or a man holding the world upon his back: I grant, that an *Atlas* is an *Ens Rationis*; but this *Ens Rationis* is like to a real being: Namely, the man is like to a man, the world like to a Globe? had we never seen a Globe, or a man, we could never have thought upon them jointly: so is a *Hirco-cervus*, a Goat-stagge, an objective being, representing a Goat and a Stagge. This

Axiome

Axiome doth also infer the same ; *Nihil est in Intellectu, quin prius fuerit in sensu* ; there is nothing in the understanding, but it proceeds from our senses. If then we know nothing, but that, which we receive from our sensation, and the Knowledge in the understanding is no hing, but a Representation of what is recommended to it by the Senses, that which we alwaies think, or can think, must be like, or must represent a real being ; because we perceive nothing, but what is really existent without the understanding. Here may be Objected, that then all real beings are objective beings ; because all real beings cause a Representation or Likeness to themselves in the understanding. The Solution is easie. In a large sense all real beings are objective, if objective be taken largely, for that which moveth the understanding, as *Smilec. also, Diss. 1. Q. 1.* well observes, *Nov quacunq̃, existentia objectiva sufficit ad Ens Rationis ; Nam etiam entia realia existunt objective in intellectu.* It is not every objective existence doth suffice to constitute an objective being ; for real beings exist also objectively in the understanding. So that I say, that it is not every Likeness in the understanding specifieth an objective being, but only a mediate and reflexe Likeness, which is formed out of the immediate or direct Likeness or *Idea* of a real being, by abstracting another or mediate Likeness from that first likeness. The likeness of a real being is immediate, and therefore needs its own real presence to impress this likeness upon the understanding ; whereas the likeness of an Objective being is formed mediately from the first real likeness (as I may call it) and is abstracted, when the real Object is absent, that is, at such a time (as I inserted above) when we are not employed in the understanding of a real likeness. I call it a reflexe likeness, because the understanding doth abstract it by a reflexe action upon it self.

Neither is that first or immediate likeness of a real being properly a likeness, but rather an Impression made by its presential action ; whereas a likeness is properly that, which is abstracted from the Impression already made by a real being, and in the absence of it, that is, when we are not employed in the understanding of a real being. So that a proper likeness is between two beings, formally different from one another. I will illustrate this by an example : Frame a Likeness upon an Impression of a real being ; as of a Dog ; as long as that Impression lasteth, you cannot make a Likeness upon it ; for we can exercise but one act of the understanding faculty at once ;

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For one formal power exerciseth but one formal act. It is then necessary that the Impression should be finished, by the cessation of the alteration of that real being upon the Sensories (which I call the absence of a real being, *a parte rei*, or the intermission of understanding a real being *a parte actus Intellectus*.) The Impression being finished by the absence of that real being, namely, of the Dog, the understanding by a reflexe and mediate Likeness upon that Impression, may by another action relate that likeness abstracted from that Impression to that same Dog again (which action is a distinct operation of the mind, formally differing from that first action of receiving an Impression) and so that Dog framed in the understanding is like to the first Impression of that real Dog again. Where observe, that this Likeness is not the same Impression, which that Dog made upon the Sensories, but a being abstracted in the passive understanding, by the Active, of the same likeness to that same Impression.

III. Another Argument to prove the formality of an Objective being to consist in a likeness to a real being, is this. As Beasts and Men are formally distinct in their Essence, so also they are formally distinct in their formal Operations. Hence I proceed thus. The perceiving of a real being is proper to a Beast, the perceiving of an objective being is only proper unto men. Wherefore as them two operations are formally different, so are their Acts, which is the perceiving of a real being, and of a formal being, and consequently, an Objective being doth differ from a real being. These Operations being supposed to be formally different, I say, that that which makes them formally different, is the *Ratio formalis* of each. That which argues or makes a being to be real, is its perception by the animal Senses. This is evident, because Beasts, who do perceive and discern real beings (for they discern Grass from water, their own Stable from another) which they cannot perceive, but by their senses: *Ergo*, the perception by animal sense is the *Ratio formalis* of a real being. That which makes an Objective being, is that, whereby a man is distinct from a Beast, which is a power of framing likenesses by a reflexion upon the Animal perception or Impression, and is an act whereby a man is *formally* distinct from a Beast: For a Beast cannot frame any Likeness: *Ergo*, The Formality of an Objective being doth consist in a Likeness to a Real being.

You may Object, that you can apprehend a being existing in your mind,

mind, to be a real being : *Ergo*, Whatever is thought, is not thought to be like to a real being, but something may be thought to be a real being. I Answer, That that, which you think to be a real being, you think it to be like to a real being, and because of that, you say it is a real being : For example, Suppose you think the *Pope* to be a real man, your thinking of him to be so, is nothing else, but your thinking him to be like to a man, and therefore you say he is a man.

Moreover, although an objective being consisteth in a likeness to a real being, the Conclusion thence is not, that that which is an objective being, is no real being, that is, that hath no real being for its foundation : for the definition doth imply it : neither are you to conclude, that an objective being is a contradictorily opposite to a real being : that is, that an objective being doth not respond to a real being, because a real being doth not exist in that manner of conjunction, as an objective being is sometime conceived, *viz.* a *Dog-cat* is an *Ens Rationis* : now the apprehending of these both together, that is, one a top the other, doth not make them formally and essentially distinct from each other, supposing them to be conceived distinctly ; for that is but accidental to them, and in effect, they are conceived distinctly in the same manner, as I have declared in the Sixth Chapter. This then being granted to be accidental to an Objective being, we must necessarily suppose each of them singly (*viz.* the *Dog* and the *Cat*) existing at present only in the understanding, to be an objective being : What, will you call them beings real beings, which now, are existent only in your understanding, and cannot move your cognoscible faculty really from without at the same time, when you know them from within ? Further, supposing, that each Component of a compounded *ens rationis*, is an *Ens Rationis* (as formally it is, for how can a whole compounded *ens rationis* be said to be an whole *Ens Rationis*, unless its parts are likewise *Entia Rationis* ? (*Nihil est in effectu, quin prius fuerit in causis*) there is nothing contained in the effect, but what was before existent in its Causes, and such as the effect is, such must the Cause have been) it is impossible, that you can think or conceive any such components, but which are respondable to a real being. Neither is it proper to call that being, which you have conceived in your mind, to be like to a real being, although that real being be before you, a real being, because now it is objective, and existent in the active Intellect, moving the passive Intellect actually : But in case you
leave

leave that Objective being, and reflect your senses to that same being which is before, then that being, which doth now move your sensual cognoscibility, is said to be a real being. But here you may say, that an objective being is formally different from a real being, wherefore an Objective being ought not so much as to have a power of existing really, which according to this Discourse it hath, and therefore the fore-stated Definition of an Objective is not to be allowed. I Answer, That an Objective being is formally different from a real being, and is impossible ever to be formally a real being: For, in that I assert a being to be Objective, I assert that it is not real, neither can an Objective being *quatenus* objective, be real, *quatenus* real. Lastly, Is a Mule more or less an *ens rationis*, because it is generated from different *Species*, or constituted in unity by part: of a different *Species*? Certainly no. So, neither is a (*Hirco-cervus*) Goat-stagge more or less an Objective being, although consisting of Parts of different *Species*: and as a Mule is not termed an *ens reale*, because it consists of different *Species*; So, neither is a *Hirco-cervus* an *ens rationis*, because it consisteth of different *Species*. But you reply, that a *Hirco-cervus* is impossible to exist really. Why? Because it doth consist of different *Species*. And what doth that hinder? That it may, is plain in a Mule. Wherefore I say again, that it is impossible for a man to think a single notion, which should be impossible to exist really. But more of this elsewhere.

An Objective being is twofold, Modal, and essential Objective. A modal Objective being is, which is like to a modal real Being. An essential Objective Being is, which is like to an essential real Being. What a real Modal, and real Essential Being is, we shall deliver in the next Chapter.

CHAP. VI.

Queries concerning a Real and an Objective Being.

1. *Whether an Objective Being and a Real Being differ essentially one from the other.*
2. *Whether a Rose in the Winter is a Real Being.*
3. *If Impossibility be the Formality of an Objective Being.*
4. *Whether the Ratio formalis of an Objective Being consists in a conjunction of many Beings, which in that Conjunction are impossible to exist really.*
5. *That an Objective Being is not existent before it is understood. A Confutation of Smigl.*
6. *That an Objective Being is only proper to the understanding.*

I. **V**Hether an Objective and Real being differ essentially one from the other. My Answer is affirmative : Because they are constituted by powers formally different from one another. Here may be objected, If a man hath powers in him, formally differing from one another, a man must also have two Forms.

I answer again, That these formal powers are not called formal in respect of the Soul ; for in that respect they are all formally one; but they are different from one another in respect to one another, and both different from the Soul materially, or, *ex Parte Objecti*.

II. Whether a Rose in the Winter be a real being. No doubt it is not ; for it moveth the understanding by a mediate and reflexe likeness. 2. It doth not move the understanding from without. For a Rose in the Winter is supposed impossible to be actually in the Winter ; *Ergo*, it hath only an Objective Being.

III. If Impossibility be the Formality of an Objective being. Impossibility is twofold. 1. It is that, which cannot exist without the understanding. 2. It is that, which cannot exist in the understanding : That which hath no cognoscibility, is no being : Wherefore

the latter of these is no being, and doth not appertain to this Query.

The first kind of Impossibility is not the formality of an Objective being; because Impossibility is a Negative, and therefore having no unity, cannot be the Form of a Positive. 2. State the Question thus; Whether possibility in the understanding, which is a positive, is the *formalis Ratio* of an objective being: neither; For a possible Objective being is that, which can move the understanding, but doth not; that which doth not move the understanding, hath no objective cognoscibility: *Ergo*, it is a *non Ens Objectivum*.

IV. Whether the *Ratio Formalis* of an Objective being consists in a Conjunction of many Beings, which in that Conjunction are impossible to exist really. In no manner: because of the Reasons alleged in the precedent Paragraph. Neither is an Objective Concept of a conjunction of many beings essentially different from the objective concept of each single being. As one being is produced, so are two or more; For example, as the *Species* of a mans head is conceived, in the like manner is the *Species* of a Drakes body apprehended; as Union is conceived by apposing one as close as may be to another, from seeing of it done by real things; so also doth the *Species* of Objective Union, appose the head of the man to the body of that Drake, and so it is a Man-Drake, which is a whole objective being. Its parts of production are three; namely, The *Species* of a man, a Drake, and Union. This supposed, it followes, that they are essentially one: because all Parts united are essentially identified with the whole. Lastly, It is not the Union which makes an *Ens Rationis*; for that is *ab extra* to them *Species*, which are already conceived, to wit, from the understanding, which is distinct from the Object understood. As the mingling of Oyl with Water doth not formally alter the Essence of the Water, or the Water the Essence of the Oyl; so neither doth the joyning of a mans head to a Drakes Body, formally alter their Essences; if only joyned, that is, by contiguity; but if united, which includes a continuity of Parts, then they are formally one.

V. Whether an objective being may be existent before it is understood. If cognoscibility is the Form (as to us) of a real Being, much more is it essential to an objective being. That it is so, is already proved. 2. An Objective being as far as it is Objective, is not fundamentally before it is known; and this is against *Smigl. Disp. 1. q. 5. I* prove it.

it. If an Objective being, as far as it is so, was fundamentally, before it was formally, as to us: *Ergo*, A Being (as to us) is before it is; but that is absurd: For *Impossibile est, idem esse, & non esse*. 2. To be fundamentally formal, and to be absolutely formal, are two forms different in essence: but it is impossible to a Being to have two essential Forms: *Ergo*, A Being cannot be fundamentally a Being, and an Objective Being at once.

I prove the *Major*. To have a being in another, as upon its *Basis* or Foundation, is a relative Essence, which cannot exist separately without its *Basis*: But a Relative Essence is formally different from an Absolute Essence, which in a manner is the proper Essence of an Objective Being: *Ergo*, Essentially and Formally different. That the Essence of an Objective Being is absolute, I prove, That which doth formally exist without a real present foundation, is an absolute Being; but an objective being doth exist without a real present foundation; for it existeth when a real being is removed, and hidden from our Senses: *Ergo*, an objective being in a manner is an absolute formal Being. Nevertheless, as I asserted before, it is respondable to a real past foundation. An Objective being cannot be so much as known in its foundation, as it is so founded. I prove it. To know a being, and to know it to be in its foundation, are two distinct Knowledges at once. But the understanding cannot know two things at once. This *Minor* is a Maxim. *Ergo*.

We may know an objective being to be, and to have its essence derived from a real being, as its foundation, but at distinct times, and by distinct acts of the Intellect, and that but improperly. Had *Smigl.* said so, he would have escaped the forementioned inconveniencies. I prove the Conclusion. An objective being is a likeness in the understanding to a real being. *Ergo* its Essence is derived from thence: for had there never been a real being, there could not have been an Objective being. A real being is the foundation of an objective being: because it is referred to a real being. Neither is this properly a foundation; because an objective being can exist without a real being; so that a real being is rather to be supposed, as a *conditio sine qua non*, or a Pattern of an objective Being; if a Pattern, then it is no foundation: for a thing abstracted from that Pattern doth exist, when the Pattern is abolished: We may see the Picture or Representation of *Alexander*, although he hath long since quitted his real Being. According to this we may Metaphorically

rically define an Objective Being to be a Picture of a Real Being, painted in the Mind.

The said *Smigl.* in the next Page, recalls his Notion, and doth again affirm the contrary, with as little Proof, as the other was. *Ens Rationis formaliter non potest esse nisi cognoscatur. Primo probatur in iis entibus Rationis, quæ sine ullo fundamento finguntur ab Intellectu: ut Hirco-cervus.* Mark, he allows some Beings not to be inherent in a *Basis*, whereas before he granted, that all beings were fundamentally; but he could not tell, whether their foundation was the understanding, or Realities from which they were abstracted. If he took the Understanding to be the Foundation of an *Ens Rationis*, then he confounds the foundation of a being, and the Subject of it, into one Notion; for the understanding is properly the Subject of an Objective Being, and not its Foundation, which rather may be attributed to the real Impression, upon which an Objective Likeness is founded. Nevertheless supposing his mistakes to be true, and allowing either of these Acceptions, he contradicts himself: For here he asserts, That an Objective Being cannot be formally, unless it is actually understood; before he saith, that it can be fundamentally (that is, inherent in the understanding, or else in the first Impression of a Real Being, take him either way) in the understanding, before it is known. Can there be any thing in the understanding, but what is understood? If there may, then the understanding is no understanding; neither will this Excuse, in saying, that a Being is fundamentally one, and formally one; for to be fundamental includes a Formality in a Foundation.

2. He affirms, That the Fiction of a *Hirco-cervus* hath no foundation, which is erroneous also: for it is grounded (or doth properly resemble a real Buck or a Stagge) upon a real Buck and a real Stagge. The like Contradictions are frequent throughout the whole Dispute.

Whether an Objective Being is only proper to the understanding. If an Objective Being is a Being, because it is intelligible, it is necessarily only appropriated to the understanding. As for a being in the will or rational Appetite, it is (as all desires or beings desired are) appropriated to the understanding; because the understanding and will are formally one, as to the Rational Faculty; neither can the Will will any thing, unless it be first represented in the

the understanding. Sensitive Powers cannot frame an *ens rationis*, because their proper Object is a Real Being.

CHAP. VII.

The Manner of Forming an Objective Being.

1. *That all Formations of an Ens Rationis are single. That the Second Operation of the Understanding is the same in Specie with the first. A Division of an Objective Being into Single and Complex.*
2. *That a non Ens cannot be known. Two Acceptions of a Non Ens.*

ALL Formations of an *Ens Rationis* are from a single and first Operation of the understanding.

2. The second Operation of the understanding is the same in *specie* with the first, differing only numerically: The like may be said of the third. The first operation of mind is, whereby we conceive an Objective Being singly, without any Conjunction to another, and is nothing else but an Impression of the Phanſie, expreſſing a real Being, made upon the understanding; and this is a single Image: As for example, the Image of a Dog in the mind, is by the first Operation. The second Operation is, when two Images are joyned together, which happeneth by the Affixion of one Image upon the other. Let the Dog forementioned be the first Image, and the Image of a Cat be another Image; this Image affixt upon the Dog, will make a Dog-Cat; and this we can imagine but confusedly; namely, a Body of a Dog, with a Cats head, or some Member of one, and some of the other, which we apprehend united into one Essence, from having perceived by our senses a like Union of two Essences into one, which is nothing but a confusion of Accidents in one: These Accidents are confused thus; Suppose that the real Image of a Dog is impressed upon one Plate, and the Image of a Cat upon another Plate: First make the Impression of a Dog upon

upon Paper with its Plate, next place the other Plate of a Cat crucially, or transversely, upon the first Impression. That Image will represent the half of a Dog, and



the other half of a Cat, to wit, the Neck and Head of a Cat, the Body is common, that being so united by the placing of the Plate; likewise there is the Head and Tail of a Dog: all these being so united in the Body seem to make a Dog-Cat: This Dog may more or less resemble its own entire representation (or so may the Cat) according to the placing of the other Plate upon it; for if the other Plate is

directly placed upon it, then it loseth its own Representation, if obliquely, then according to the manner of that obliquity, the one is more represented than the other. So likewise a complexe *Ens Rationis* is framed by the second Operation of the understanding; first it elicits one Being out of the Memory, which having made an *Idea* in the passive understanding, the active understanding elicits another being, which being immediately placed (as it were) upon this other *Idea*, which may hide the greater or lesser part of the first *Idea*, & so the understanding cometh to apprehend a complexe *Idea* by a double or second Operation. Here may be demanded, how the understanding can apprehend a double *Idea* at once, since that the understanding, as it is formally and materially (*formaliter & materialiter*) one, can apprehend but one thing at once. You say it is formally one, because it is distinct formally from the other faculties, it is materially one with all the other Faculties of the soul, because Faculties in this latter sense are taken for Determinations of the Acts of the Soul upon Objects. I resolve you thus: The understanding doth not apprehend two objective Essences at once, no further then them two essences make one, that is, one Representation. They make one in this manner: The understanding elicits in the Phantasie one *Idea*, The Phantasie being as a fluid continuous Ayr, expanded in the Brain,

Brain, (for of that nature are Animal Spirits) is capable of receiving that Impression. This Impression made, holds no longer then the understanding doth act upon it, for the understanding understands by making through its own immediate vertue an Impression upon the Phanse; like to the same Impression, which it had once produced upon it by an abstraction from without. Then the understanding frames another being by degrees, one part after the other, and being intent in making that present *Idea*, its vertue having lost the former *Idea*, the first *Idea* loseth somewhat of its perfect Impression; for the Phanse is just like the Quick-sands on the Sea-shore, whereon if you make an Impression, that Impression will remain as long as the thing impressing remaines applied to it, and some while after; but being removed, the Sand comes by degrees to its own plain Form again: Now if you impress another Impression upon the first, the last Impression doth obscure the first; yet nevertheless joynes its Figure to the other, which two are like to one. This double Impression *Smigl. Fol. 46.* calls *Compositio Objecti*, and the Speculation upon this Composition he names *Compositio actus*. Enquire in my 2^d Book, of second Part, and you may know further.

Wherefore hereby I would infer, that the Speculation of the understanding upon these two Impressions upon the Phanse, is one formally and numerically; but the acts of impressing of the understanding are many, differing only materially.

2. That the first Operation of the mind, which here I take for an Act or Impression of an *Idea* by the understanding upon the Phanse, is no wise formally different from another (as the Second or Third may be) succedent upon it.

Hence I infer the Division of an objective Being into a single objective and complexe Objective Being. What they are may be collected from the Precedents.

A *Non Ens* cannot be known, because it cannot be impressed: for it hath no Figure. We say It or That *Quiddam* is a *Non Ens*, not because we know that *Quiddam* which we speak of, to be a *Non ens*, for a *quiddam* and a *non ens* are Contradictories; but because we conceive that *quiddam* not to be like to another *quiddam*, which we had expected it should have been like to, and therefore we say, it or that *quiddam* is a *non ens*; so that a *non ens* in that signification is only a difference of one being from another; and in this sense, we say one thing is not another, as a man is no Beast, or no bestial thing,

thing that is, is a nothing bestial (*non ens bestiale*) or not that, which doth represent a Beast.

2. A *Non Ens* is taken for that which hath no Resemblance to any thing real, nor consequently to any thing we can know; for we can know nothing, but what hath a resemblance to a real being, wherefore we call a *non ens* that, which cannot or doth not move our sense or understanding. A *non ens reale* is that, which cannot or doth not move our cognoscible faculty from without. A *non ens objectivum* is, whatsoever cannot or doth not move our understanding from within. So that a *non esse* implies little more then (*quies*) rest of the understanding from Action, hapning through a not moving *non-cognoscibility*.

CHAP. VIII.

Of the Formality of a Real Being.

1. *What a Real Being is according to the Author. The Derivation of res and aliquid. That it is very improper to call it a real Being. The Cause of that Denomination.*
2. *That the Phanſie is the immediate Subject of an Ens Reale.*
3. *That the Understanding is only the Mediate Subject of Real Beings.*

A Real Being is that, which move: the understanding from without. *Res* and *Aliquid* are *Synonima's* of a real being: For it is called *Real* from *Res*; and *aliquid* from *alind quid*. Let us enquire why *Res* and *Aliquid* should more be *Synonima's* to a being from without, then to an Objective being. Certainly *Res* and *Aliquid* rather imply a being in general, then any of its *Species* in particular. And it is probable, that *Ens* was framed out of *Res*, by leaving out the *R*, and placing *N*. between *E* and *S*. How absurd is it then to say *Ens Reale*, which is the same, as if you said *Ens Ens*. For *Reale* is nothing else but an Adjective changed out of the Substantive *res*. *Aliquid* might rather be called *unumquid*, and it is likely, that it was first so called, which others probably did change out of a wantonness of Speech, covering new words, and rejecting old ones, as it is observable at present among most Nations, who frame new

new words every year, which although are but few in a year, yet all them yearly words, being retained in use for a hundred years, beget a great change of Speech, until at last, the whole Language seems to be changed: Wherefore in stead of *unum*, they prefix *ali-* & made the word *Aliquid*. It may be you will divide its Etymology in *ali-* and *quid*, and then it will signifie the same with *something else*. However its intended signification was *Something*, which in *English* seems to be composed out of *one* and *thing*? leaving the *S* out, and changing *M* in *N*. From which Premises it followes, that (*ens ab extra*) a being from without, would more properly denote the same which is intended by a Real being. And (*ens ab intra*) a being from within, might more properly denominate what is expressed by *Objective*: because Objective may as well be attributed to a Real being as to it.

Nevertheless there may be a Reason given why *res* or a real being was imposed to denominate a being from without. That which man perceived first, was a being from without, and consequently did first impose the name of a *thing* or *res* upon it, which without distinction did then properly denote that being from without; for the name of a *Being from within* was as then not yet conceived: wherefore that name was originally and immediately intended to denominate a being from without, and hath since been retained in use.

II. The immediate Subject of an *Ens reale* is the Phanſie. I prove it: that which doth distinguish real beings one from the other, is also the Subject of their inherence (that is, *quoad ad cognoscibilitatem*) But such is the Phanſie: *Ergo*. I confirm the *Minor*: The immediate Subject must be either the understanding, or animal Phanſie. But not the understanding, because Beasts, which are void of understanding, do distinguish Real Beings from one another. *Ergo*, The Phanſie is the immediate Subject of Real beings.

III. The understanding is the mediate Subject, because the understanding perceives the same real beings by mediation of the Phanſie. I prove it: If the understanding cannot perceive a real being, when the Phanſie is tied, which is, when a man sleeps, then the Phanſie is the mediate cause of the perceiving of a real being. But the understanding cannot perceive real Beings, when the Phanſie is tied. *Ergo*, the Phanſie is the mediate cause, by whose mediation the understanding becomes the Subject (*Subiectum cognitionis*) of a Real Being.

CHAP. IX.

Of the Division of a Being in Universal and Singular.

1. *A Being is divisible into universal and singular.*
2. *What an universal being is according to the Author.*
3. *What an universal Real being is.*
4. *What an universal Objective being is.*

I. IN the foregoing Chapter hath been treated concerning the next Division of a Being; now followeth the remote division of a being in *Universal* and *Singular*. This Division is communicable to each of the next divided Members: Thus a real being is either universal or singular. So again an Objective being is either universal or singular. The Proof of these Divisions you will read below.

II. An universal being is a being common to two or more Singulars. Commonness here is a likeness in *Idea* of two or more beings. I prove the Definition. 1. That there are common Beings. If two or more singulars do move the understanding in likeness of *Idea*, and the understanding doth perceive two or more motions of singular *Idea's* to be one in likeness (for a being must be one, and cognoscible in that unity) then there are common or universal beings. But two or more beings move the understanding in likeness of *Idea*, and the understanding doth perceive two or more motions of singular *Idea's* to be one in likeness: Ergo there are common or universal beings. I confirm the *Minor*: Two Horses move the understanding in likeness of *Idea*; they both having one shape & commonness in external habit, make a like Impression in the Phantasie, & by that both are distinct to the understanding from other beings; as from Fishes, Birds, &c. ergo, Two or more beings move in likeness of *Idea*. 2. There is not only a commonness required, but also an unity, or how could they be beings else? *Nam Ens & unum convertuntur*. I prove that this commonness is one: If this commonness of *Idea* be indistinct from it self, and distinct from all others, then it hath an unity; but this commonness is indistinct from it self, and distinct from all others. Ergo.

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The Concept or Impression of two shapes of Horses are indistinct from themselves; for you find no distinction in a likeness, as far as they are like, otherwise they would not be alike. It is distinct from all others, because no other beings can represent the same likeness of Figure, and not be Horses. *Ergo*.

By Figure
understand;
the Habit
of Modes in
one essence

III. A real universal being is, which moveth the understanding from without. I have proved, that there are common unities moving from without; If so, *Ergo*, there are common real unities. Beasts discern common real beings. I prove it: A beast, as a Horse discernes an edible being from a non edible being: but edible beings and non edible beings are commonnesses: *Ergo*. The *Minor* is undoubtable; for hold forth a stone and Hay to a Horse, he will refuse the stone, and take the Hay. You may say, a Horse doth not know Hay as an universal but as a singular. I deny that, for a Horse knowes Hay, because that Hay, which he takes now, is like in externals to the Hay, which he used to eat.

2. A Horse knows Oates from Hay; for hold Oates and Hay to him, he will take Oats before the Hay: Now he doth not take Oates before the Hay, because they are such individual Oates, but because they are like to Oates, which he used to eat. You will reply again, that a Horse knowes Oates and Hay from a Natural Instinct. I deny that also: for had a Horse no senses, his Natural Instinct would not make him chuse Hay before a Stone. Besides, it is apparent in a Dog. Suppose a Dog were between a Rank of men, and a Rank of beasts, he would leave the beasts, and run to the men: *Ergo*, he knowes men from beasts: he runs to men in general, as they have all a commonness of men in them. The Reason, why the Dog runs to men, is, because a Dog having been accustomed to live with one singular man, he runs to all them men, because they are like to that singular man: *Ergo* it follows that a Dog knowes Resemblances.

IV. There are universal objective beings. An universal Objective being is, which doth represent an universal real being in the understanding. If there were not universal real beings, how could we apprehend universal objective beings? For *Nihil est in intellectu, quin prius fuerit in sensibus*. For example, man conceived in the understanding, is an universal objective being: because he represents a commonness of two or more men. If the understanding apprehends a man; *ergo* there are objective universal beings: because the apprehension of a man in the understanding is an objective being: But

the understanding apprehends a man: *Ergo*.

By this Discourse I may seem to have mistaken my self in giving the Definition of an Objective, whose formality consisted in a likeness to a real being, whereas now again I assert, that the formality of an universal real being consists in a likeness between two or more Singulars, wherein then (may you ask) is a single objective being different from an universal real being? I Answer, 1. In that the likeness of an objective being is formed by the understanding, but the likeness of real beings is perceived by the Phanse or common sense. 2. The likeness of an objective being is a single likeness compared by the understanding to a single real likeness, whereas the other likeness is a plural and common likeness. 3. The Likeness, which intercedes between real singular beings, is between beings of the same Rank and Gender, whereas the likeness of an objective being to a real being is between beings of different formalities; the one existing without and moving from without; the other existing within, and moving from within.

CHAP. X.

Of universal and singular Beings.

1. *That there are no Platonic Idea's. That universal beings are not really different from their Singulars. Wherein an universal is distinguished from a singular. That singulars being abolished, universals thence abstracted, are also abolished with them.*
2. *That universal Beings are formally distinct from singulars.*
3. *Singulars are primum cognita.*
4. *Universals are notiora nobis.*

1. **T**Here are no universal beings really distinct from singular beings, as was the Opinion of *Plato*, in that he stated *Idea's* really distinct from singulars, because singular beings when they are abolished, the universals are also abolished in them. As for the Arguments of *Plato* against it, they are very futile; whereof this is one of the prime. There are Sciences: *Ergo*, there are universals. I grant it, but not really distinct from their Singulars. You may reply,

that

that Sciences are Necessary; therefore their Subject, which are universals, must be necessary: But they cannot be Necessary, if inherent in singulars; because Singulars are contingent. To this I answer, That if all Singulars were so contingent, as to alter their Habit and Shape, so as that they had one shape now, another to morrow, I confess singulars would be contingent; but singulars in their quidditative shape or habit are not changeable, so as to change all in singular from that quidditative shape. 'Tis true, some singulars may be abolished, yet as long as there are two left, the universality, which they did constitute, is not abolished, but maintained by them two, There must be two at least, because if there was but one, it could have no commonness; for commonness relates to another or more. Many Singulars may change in many Accidentals, as in one or more particular Moods; yet this doth not change the quiddity of a being, unless all Accidents together (which I call a quidditative shape) change in all Singulars. Since then that these changes are not observed in singulars, they are not to be counted contingent, but as necessary as their Sciences. Another Argument he proposes, is this: All singular men being abolished, yet there is a Science of man, as he is an universal: *Ergo*. The Falshood of the Antecedent appears from the truth of the contrary; to wit, that there is no Science of man, man being abolished in all his Singulars; for a Science is a Science as to us only: not but that there is also a science in spiritual beings, but that not concerning us farther than is revealed by the Holy Bible we consider all things besides only as to us. 2. Suppose that Fishes were all abolished, yet you may say, there remains a knowledge of fishes in us. 'Tis true, there doth remain a knowledge of fishes, but not of real fishes, but of imaginary fishes, like to those which have existed. 3. Universals, as they are Subjects of Sciences, are *Entia Rationis*, which do remain after the existence of real universals.

II. Universal beings are formally distinct from their Singulars joyned all in one number, because they differ in their Definition. A singular being is that, which hath a single Essence. By single is to be understood incommunicability (that is, *quoad accidentia omnia collecta eo, quo sunt, modo*) according to all its accidents collected in the same manner as they are; for although their prime and most obvious Accidents are common to them of another being, as they are abstracted from Accidents less obvious (which kind of abstraction

tion constitutes an universal being) yet the *ᾀσις* of all the Accidents of a *singular being* collected, is only proper to that singular being, and incommunicable in that *ᾀσις*. I cannot but strange at the Conceit of most *Peripateticks*, who take an universal being to be only a communicable and abstracted unity. This communicable unity is the Matter and Form of singulars abstracted from their individual Accidents. Pray, what Concept can you have of Matter and Form without Accidents? What can you conceive the Matter and Form of an Ass to be without his Accidents, as hairy skin and long Eares, and singular figure of Body?

III. A Singular is *primum cognitum*, because we must know these first, before we can conceive an universal being.

IV. A universal being is *Notius nobis*, or is better known to us then a singular; for we can discern the shape and *ᾀσις* of an universal being, before we can know the *ᾀσις* of its singular beings. For as far off we know that a man is a man, that is, is like to the universal being, before we know, what man he is, or know his individual Connexe of Accidents. 2. It is easier to know an universal being than a singular; for oftentimes when we see a singular person, we doubt whether he be the same which we have seen before, yet at that time we know him certainly to be a man, and like to his universal being: besides, we do less forget an universal being, then a singular, and so consequently it is more known.

The Reason why an universal being is more known to us then a singular, is because the Modes of an universal are the most eminent and evident Modes of singulars, abstracted from their more obscure and inferiour Modes.

V. One singular is not enough to constitute an universal, because there can be no Resemblance abstracted from one. You may object, that the understanding may abstract an *Idea* from one singular, and frame another like to it within its self; that granted, it could be no universal being, neither real or objective; not real, because there is no resemblance of one real *Idea* to another, unless there be another existent; but of an objective *Idea* to one real *Idea*: not objective, because the resemblance of *Idea's* are of different Natures.

VI. An universal Nature is by meanes of Abstraction, as it doth also include Comparation. *Smigl.* in his 4th. *Disp. Q. 8.* proposes his Opinion of the manner of Production of an universal. *Universale fit per potentiam abstractivam rerum, non cognoscitur nisi per comparativam.*

ivam. An universal being is constituted by an abstractive knowledge, but it is not known unless by a comparative knowledge, Wherein he asserts that an universal being is capable of an essence before it is known. That this is not, is evident by what hath been proved in the 6th. Chapter. You may plainly observe a Contradiction in these words of his. *Fit (saith he) per notitiam abstractivam: Ergo cognoscitur. Etenim quomodo potest universale dici fieri per notitiam, & non cognosci? Quippe fieri per notitiam abstractivam, & cognosci abstractive, sunt idem re & nomine. Siquidem cognoscatur abstr. & iver eo ipso cognoscitur; ergo cognoscitur eo ipso, quo fit puncto.* To this he annexes a triple Principle, contributing to the production of an universal being, to wit, *Negation of Abstraction of Unity, and of non-repugnance*: which being stated, an universal is also stated. By Negative Abstraction is meant, an universal Nature abstracted from its singulars by predicating it negatively of the singulars. I wonder how a thing can be negatively predicated of another, and it not known. If known, *ergo* it is, before it is predicated of another. Therefore it is no Negative abstraction. Unity is inseparable from a Concept, for all Concepts are one, and of one; so that that is implied in a Concept. His third Condition required a *non-repugnance*; which is co-incident with the whole falsehood of his imagined *Universale*. A *non-repugnance* is a Negative, and therefore is not essential to an *Universale*; that being Positive. *Ergo*, It must rather import a positive relation to its Inferiours. Here again you have another Contradiction. First, he saith that an universal being cannot be known by a comparative knowledge. What is a comparative knowledge, but a common Nature actually and positively resembled and compared to its Inferiours? This by the way, and now I return to my Proposition. By Abstraction is intended the Apprehension only of Commonnesses in singulars; which Apprehension of Commonnesses doth *per se* only apprehend what is common in singulars, and thereby doth exclude the Apprehensions of *Non-commonnesses*: Wherefore 1. Abstraction doth *per se* imply a Positive, and *per accidens* a Negative. 2. Abstraction doth include Comparison, because Commonnesses cannot be abstracted unless compared to one another.

CHAP. XI.

Of the Extream Division of a Being.

1. *Another Division of a Being.*
2. *What the greatest or most universal is.*
3. *What the greater universal is.*
4. *What a less universal is.*
5. *What the least universal is.*
6. *How the Fore-mentioned Members are otherwise called.*

I. **A**N universal being is either most universal, greater universal, less universal, or least universal.

II. The greatest or most universal is, which is common to all beings; as a transcendent being, or a being, as it is the Subject of *Metaphysics*.

III. A greater universal being is, that which is comparatively abstracted from less universals; as a living being is abstracted from men, beasts, and Plants, because they have a Commonness of *Idea*, as far as they are living: This Commonness is abstracted from men, Beasts, and Plants, as they are less universals.

IV. A less universal being is, which is abstracted from the least.

V. The least universal is, which is immediately abstracted from Individuals.

VI. Among *Logicians* the greatest *universale* is termed *universale universalissimum*, or *Genus summum*. A greater universal is called *Genus intermedium* or *subalternum*, or *majus universale*. A less universal is known to them by the Name of *Species subalterna* or *media*. The least universal is also named *Species specialissima* or *infima*. These Terms are of great use in *Logick*, and being proper to that Art, they are considered therein a different manner to what they are here; wherefore I shall omit any further Discourse upon them.

CHAP.

CHAP. XII.

Of the Modes or Parts of a Being.

1. *What a Mode is. Whence a Part is named a Part. Whence a Mode is termed a Mode. The Scotch Proverb verified.*
2. *The Number and Kinds of Modes. What an Essence or a whole being is.*
3. *That a Mode is the Summum Genus of all Beings, and their Parts.*
4. *The vulgar Doctrine of Modes rejected.*
5. *That a Substance is a Mode of a Being.*
6. *That a Mode is an univocal Gender to a Substance and an Accident.*
7. *That a Substance is an Accident, and all Accidents are Substances. The Difference between Subsistence and S^tistance.*

I. **I**T is time I should propose somewhat touching the Modal Division of a Being, which is its partition into Modes.

A *Mode* is that, whereby a being is incurrent into our Knowledge. I have oft told you, that a being, as to us, is a being from its cognoscibility, that is from our perceiving it to be something. Our Perception is either sensual or intellectual: The latter whereof is obliged to the former for all its knowledge. Wherefore a real being is a real being from its sensible cognoscibility; and an objective being is an objective being from its intelligible cognoscibility. We know a being either in its whole or parts. The Parts are called Parts, Divisions, and Partitions; because they are apprehended by us dividedly or parted, as they are inherent in a being; or because they part or divide our perception, that is, move it in a distinct manner. The distinct motions, partitions and divisions of Parts are otherwise termed *Modes* or *Manners*, because they do modificate the Senses; that is, move them in various manners. These we say are real, because we imagine them to be just so in nature, as we apprehend them to be. We must then give credit to that trite Maxim of the Northern people of this Island, who vulgarly cry out, *Onut awaa al tings ar bot nootiens*. Modes are little else but the various faces of a being,

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through

through which it makes it self known to us as it were in various manners. We know a being in the whole, when we know it in all its Parts or Modes.

II. As many several maners as a being doth move the senses through, so many several *Modes* there be. A being moves the Senses through its Unity, Truth, Goodness, Existence, Substance, Quantity, &c. Their Number you will find in the 14th. Chap.

Attributes, Accidents, Properties, and Modes are *Synonima's*. They are called Attributes (*a parte actus*) because our Intellect doth attribute them to the various motions of a being upon the Senses. Accidents are imposed upon a being, because they befall to it accidentally, or by chance from our understanding. Properties are so called, because they are proper to a being, and without which a being cannot consist.

We cannot say, that a being is any thing else but its Modes united; for if we say, it is something beyond them Modes, we say more than we know; for we know a being no further then its Modes, or no further then it moves our Senses. Besides, take away unity, truth, substance, quantity and the remaining Modes from a being, what can any man imagine to be the Overplus? even nothing. But more of this in the Next Chapter.

III. Hence I gather, that a Mode in a large sense is the *summum Genus* of all beings, because it predicates of all beings and their Parts. It predicates of a whole being, because in a large sense it imports the manner of Representation of an entire Essence.

A Mode is more or less universal, or Singular. An universal Mode is a Commonness of singular Modes. A singular Mode, is inherent in every singular being.

The more and less universal Modes I have enumerated in the 14 Chap. Their Descriptions you may read in the Following Chapter.

IV. The Vulgar of Philosophers state a different description of a Mode. A modal Entity or Mode (say they) is that, which cannot be separated through the Divine Power from that, which can be without it, in respect to which a thing is said that other thing, which is separated from it. Wherefore that, which can be separated in two Entities, but not reciprocally, is said to be a thing: and that which cannot exist without, is called a *Mode*. You have an Example in Matter, which is united, and in its union, through which it is united,

that

that same Matter can through the Divine Power exist without the same Union to that individual Form, in union to another distinct Form: but that union cannot through the Divine Power exist without that very same Matter. Whence it is, that the union is said to be the Mode of Matter, and the Matter is said to be the thing in respect to that union. The same Distinction I conclude from this Doctrine to be intercedent between Action and the Agent Principle; as also between Passion and the Patient Principle: between Subsistence and its Nature.

By this they seem to suppose a real difference between a Mode and its being or Nature; but withal they assert, that this real difference of existence is not Natural, but Supernatural.

If then there is no Natural real difference between a Thing and its Mode; *Ergo*, According to their own Opinion, a Mode is identified Naturally and Really with the thing, and consequently a thing must be constituted out of the Congress of its Modes.

V. I say that a Substance is a Mode of a Being. For it is evident from their own words, that it is Naturally inseparable from its Nature; *ergo*, a Substance is naturally and really the same with a Nature substant or subsistent. 2. A Substance doth as much and as properly modify its Subject as any other Mode: for by it a being appears to our sense to be subsistent or substant. 3. A Substance hath no other Subject to inhere in, then them other Modes united, but more especially it inheres in quantity: that is, a being doth become a *Substant* to other Accidents or Modes by means of its quantity: For if you take away quantity from a being, whereby shall that being become a Substant to other Modes? 4. To subsist of it self is not the Essence of a being: For they confess that supernaturally it is separable from its Essence; *Ergo* It is somewhat else, and can be nothing but a Mode. 5. A Mode is that, whereby an Essence is in part made known to us: but an Essence is in part made known to us by its subsistence or existence *per se*: *Ergo*, it is a Mode. Or thus: The Parts of an Essence are distinguished from one another by their Modes or distinct manner of Representation to sense, but a Substance is distinguished from another Mode through its distinct manner of Representation; *Ergo*. 6. If a Substance agreeth in moving the Senses, in inseparability, in time or duration, with other Modes; *Ergo*, it is neither more or less a Mode then they. But the Antecedence is true, *Ergo* the Consequence is true also.

Any other Mode is as little separable from its Essence without the destruction of it as a Substance: For take away Quality or Quantity, it will destroy the Essence as much as the separation of a Substance; the like conceive of their Quality, Duration, &c. as all other Modes are variable, so is a Substance, which may be augmented and diminished; for a Substance sometime becomes a greater or lesser substance, from the Augmentation or diminution of Quantity. Lastly, You say that a substance is that, wherein all the Nine Accidents do inhere *tanquam in Subiecto*. But then tell me what that thing is wherein all the Nine Accidents do inhere? Possibly you will say, that that wherein the Accidents are inherent is latent; that is, is not cognoscible. But again, if it be not cognoscible, how do you know it then to be a thing? *Ergo*, you speak more then you know: If so, wherein is it distinguished from a *Chimera*?

VI. A Mode is an univocal Gender to a Substance and the other Modes; because it is equally predicated of them.

VII. The Consequence of this Discourse doth infer the Division of a Being in a Substance and Accident to be erroneous; because an Accident is affirmatively predicated of a Substance; for a Substance is nothing else but a Notion, which accidentally or by chance is attributed by us to a being.

Every Mode of a being is predicable of a Substance, and a Substance of it. For every Mode is subsistent through it self, that is, it need not another to constitute its formal modality. To subsist through it self, is not to subsist through another, but every Mode subsisteth through it self, and is through it self, that which it is; for Quality doth not owe its Subsistence to Quantity, nor Quantity to it; but each of them subsist through themselves, and are Modes through themselves. Each singular Mode cannot subsist of it self, as needing the concurrence of all the other modes; & therefore they subsist or depend from one another. This Dependence from one another might rather be termed Substance (*quia unum alteri substat i. e. unum alteri est fulcimento*) because the one doth stand under the other as a Pillar to uphold it. Subsistence doth more properly denote the subsistence of a Mode through it self.

CHAP. XIII.

Of the Attributes of a Being.

1. *Why a Property is so called.*
2. *The Difference which Authors hold between Passion and Attribute.*
3. *That Passion and Attribute, as to their Names, imply the same Thing.*
4. *That Attributes are really the same with their Essence. That all Attributes of a Being, as they are united, are the same with their Essence or Being.*
5. *That the Attributes are formally distinct from one another.*
6. *That that, which we conceive beyond the Attributes of a Being, is nothing.*
7. *What an Essence is.*

I. **A** Property or Propriety of a Being is so called, because it is not the essence of a Being, but doth concommutate it, as a *Proprium quarto modo*, flowing from its *Quiddity*. These in Physicks are termed *Passions*, which are Properties Physically derived from their Essence, and are individually concomitants to it out of the Nature of the thing. In *Metaphysicks* the same are named *Attributes*, because they are attributed from our Understanding to a Being.

II. Although *Passions* and *Attributes* do formally signify the same thing, nevertheless have Late Authors retained a formal Distinction between them: to wit, in that *Attributes* are physically identified, but formally distinguished from their *Entity*; but *Passions* are both Physically and formally identified with their *Entities*.

III. *Passion* and *Attribute*, as to their Names, are identified, and imply the same thing; for it is called a *Passion* (a *Patiendo*) from Suffering, because a Being doth suffer such a distinction from us, that is, from our Mind and Understanding. So *Attribute* is imposed from our understanding, because it doth attribute such a distinction from

from our Concept to a Being. Wherefore to be *attributed unto* from our understanding, and to suffer from our understanding, imply the same thing.

IV. Attributes are really the same with their Essences, because they cannot exist asunder. All the Attributes of a being, as they are united, are really and formally the same with their Essences. A real Formal Distinction ariseth from a specified Concept in our minds of two or more real Entities. The understanding cannot have a formal specified Concept of two or more real Entities, unless they are really distinct, that is, move the understanding distinctly from without. Wherefore all the Attributes united, moving the understanding in the same manner as the Being or Essence it self, must be really and formally the same. That the Being it self and its Attributes move the understanding in like manner, is evident. For wherein doth a being move the understanding, but by its Attributes united? And wherein do the Attributes united move the understanding, but by their being and Essence? You may enquire, why then Attribute doth in its formal Concept signifie distinctly from the signification of a being? I Answer, that a being, as to us, is an Essence composed out of the congress of all its Attributes or distinct manners of moving the understanding, which if considered separately are called *Attributes*, if united, a Being or Essence.

V. Attributes are formally distinct from one another, because each moves the understanding in a distinct manner, which causeth a distinct Concept; which concept (*a parte actus*) defines their *Formalities* or quidditative Representations distinct one from the other.

Attributes are not really distinct one from the other, because they cannot exist asunder.

Attributes may also be called Modes in a strict sense, as they do signifie a distinct manner of moving the understanding.

VI. That which we conceive of a being beyond its Attributes, is nothing (*a non ens*) for we can neither describe or define it.

VII. Hence we may conclude, that Essence (as to us) is a Representation of all the cognoscible Attributes of a being in unity.

CHAP.

CHAP. XIV.

Of the Kinds and Number of the Attributes of a Being.

1. *Whence the Number of the Attributes of a Being is taken.*
2. *The Number of Attributes constituting a Being.*
3. *All Attributes are convertible one with the other, and each of them, and all of them in union with an Essence or Being.*
4. *That all the Attributes of a Being are equal in Dignity and Evidence.*
5. *That the Order of Doctrine concerning these Attributes is indifferent.*

I. **T**HE Attributes of a Being are as many, as are requisite to make it cognoscible.

II. The Conditions or Attributes concurring to the Cognoscibility of a Being are, *Unity, Truth, Goodness, Existence, Subsistence, Distinction, Termination, Perfection, Necessity, Quantity, Quality, Relation, Action, Passion, Situation, Duration.*

These do all concur to the *Cognoscibility* of a Being, because one of them being defective, we cannot know a Being perfectly.

III. All their Attributes are convertible one with the other, and each of them with a Being. Thus all, which is true, is good; all what is good, is existent, &c. So all what hath Quantity is a being; all, what hath Quality, is a being, &c. Wherefore one of these Attributes being stated, they are all stated: and one being abolished, they are all abolished.

IV. They are all of an equal Dignity and of the same Evidence, (*quoad Naturam & quoad nos*) If any may be said to be the Root or Foundation, it must be Unity; for a thing must be one, before it can exist: But since there may be replied, that nothing can be one before it is existent; there can be no ground stated.

V. Neither is it any matter, which is treated of first, they being all of one Dignity and Evidence: Nevertheless, I shall observe the received Method in Discoursing on them.

CHAP.

CHAP. XV.

Of Essence and Existence.

1. That Essence and Existence are generally received for Principles.
2. That Essence is no Principle.
3. That Existence is no Principle.
4. What Existence is according to the Opinion of the Author.
5. That Existence is intentionally distinct from Essence.
6. That Essence is perfecter than Existence.
6. That Existence is formally distinct from Substance.

I. **E**ssence and Existence are generally received for the two Principles of a Being: But how they are Principles, and why so received, is not so generally explained. Principles are internal and original Causes; namely, the first Causes of all the Passions and Attributes, which do concommitate their Position; internal, because they through their presence constitute the whole.

II. Internal Principles are constituted at the same time; so (*materia secunda*) the Second Matter (according to *Arist.*) is constituted at the same moment of time, when the Form doth advene. But an Essence is an Essence (according to the same Philosopher) although Existence is not advened to it. Wherefore they are no constitutive Principles.

You may say that Essence is like to (*Materia Prima*) the First Matter, and therefore may be like to it, in that it is a (*Principium generationis*) Principle of Generation, so which it is not improper to be before the advent of a Form: Wherefore Essence may be taken for a Principle of Generation. Suppose that granted, to wit, that it is like to *Materia Prima*, in that it can be without a Form, it is no consequence, that it should also be a Principle of Generation, because a Principle of Generation is changed into another thing, by the advent of a Form, as *Materia prima* is no longer a *Materia prima* at the Advent of a Form, but a *Materia secunda*. But as for Essence, although Existence is adjoynd to it, it remaineth essence still, and is in no wise changed.

III. Existence is no Principle, by reason it is no original Cause through

through it self of all the Affections of a Being, but a concomitant affection of an Essence. You may object: That through *Existence*, all the other *Passions* are attributed to the Essence; so that if an Essence was not existent, none of the other *Passions* could be related to it. I Answer: The same Objection may be applied to any of the restant Attributes: as, if an unity was not adjoynd to an Essence, the other Attributes could not be related to it. Wherefore all the Attributes of a being are equal one to the other, and all together are equal to the whole, which is the Essence.

IV. *Existence* is an *Attribute*, whereby a Being is actually constituted. By *Existence* a Being is seated beyond Generation, and reduced to an *Ens constitutum, vel generatum*, so that Existence doth follow the Position of all the Attributes in union: or rather is, whereby the Position of all the Attributes in union is produced. Wherefore Essence without existence is only a *Chimera*, and impossible to be.

V. Existence is distinct from an essence (*intentionaliter*) by the operation of the mind; because it moves the understanding in a manner different from the motion of an Essence.

Actus Essentialis and *Existence* are *Synonyma's*: for they denote the same thing, neither is there any distinction between them, either *ex parte Objecti*, or *ex parte actus*; that is, really, or intentionally.

Essence is perfecter then Existence; because Essence comprehends in it Existence, and all the other Attributes.

Existence is formally distinct from Substance or Subsistence, in that the latter is an Attribute constituting a being independing from another: but existence denotes only a Position of all the Attributes in union. This Question doth somewhat puzzle *Oviedo*, *Fol. 286. Met. Cont. 2.* Where he doubts wherein existence is distinct from a Substance. He is forced to Answer, that the existence of a Substance is a Substance, and the existence of an Accident is an Accident: although a little before he admits of a formal distinction between them. By this Answer it would follow that a Substance were an Accident, and an Accident a Substance; because they agree in *uno tertio incommunicabili*: for existence is only communicable to a being; ergo a Substance and Accident are one being.

CHAP. XVI.

Of Unity.

1. *That Unity superaddes nothing Positive to a Being.*
2. *What Unity is. That Unity properly and per se implies a Positive; accidentally and improperly a Negative. What is formally imported by Unity.*
3. *That Unity is illegally divided in unum per se, and unum per accidens.*

I. **U**Nity doth superadd nothing Positive to a Being. For Unity is *essential* to a being; that is, it constitutes part of its Essence: Without which unity, a being is no being. Wherefore nothing can be said properly to be superadded to a being, unless a being were a being without it, and before it; or unless it be no part of a being.

II. Unity is an Attribute of a being, by which it is one in it self, and distinct from all others.

To be one in it self, is to be not many, and to have but one Definition, or one Formality. A being may be divided into many, notwithstanding each of them many are one still after their Division: And if you proceed to an infinite Division (as it were) each Particle divided will be one still in it self, before its Division. Wherefore unity is inseparable from a Being. By one in it self, understand a positive unity, not negative: for a Negative is a *Non Ens*.

Unity formally is not an indivision of a being in it self; because indivision is accidental to it: For if Division be accidental to a being, Indivision must also be accidental to it. Unity doth rather include or imply an Identity of Parts to the whole. By unity a being is distinct from all others: that is, each being by its unity moveth the understanding terminatively, by which terminative motion one being is distinguished from another being. By terminative understand a Positive, a Negative being incognoscible.

III. Unity is illegally divided in unity through it self (*unum per se*) and unity by accident (that is through another) or *unum per accidens*: Because all real unities are *one* through themselves; and consequently

sequently all formal unities (that is, unities *ex parte actus*) are also one through themselves. You may object, that a Heap of Corn, a House are unities *per accidens*. I Answer, That a Heap of Corn, as far as it is a heap, is *one through it self*; because it doth represent it self by an unity: which representation is the ground of a formal unity, or unity *ex parte actus*. I prove it to be a formal unity, because the understanding can define it: *Ergo*, it is one: For whatever is definible, is one. Why cannot a heap of Corn represent an Object one in it self, as properly, as a Multitude or heap of Individual men represent an Universality? Why cannot a House, although it consisteth of Parts, when divided from their whole (namely from that House) differing one from the other, constitute an unity in its Object, as justly, as an individual man, who consisteth also of Parts, when divided, different from one another?

Unity is either Numerical, Specifical, or Generical; that is, more or less universal or singular.

CHAP. XVII.

Of Truth.

1. *Why Truth is called transcendent.*
2. *What Truth is.*
3. *An Objection against the Definition of Truth. That a Monster is a true Being. That God although he is the remote efficient Cause of a Monster, nevertheless cannot be said to be the Cause of evil.*
4. *Austins Definition of Truth.*
5. *That Falshood is not definible. How it may be described.*

I. **T***ruth* here is called Transcendent from its constituting a being in its Transcendence.

II. Truth is an Attribute of a being, whereby it appeareth to us to answer its end, or to that, which it was intended for. To Answer its end consisteth in the Conformity of a being to the Pattern or *Idea* in the Divine Mind. All beings are created by the all-creating God for an end; and therefore are necessarily true, because

because they must necessarily obey their end, as having a necessary Cause, which is Gods Ordination.

III. Against the Definition of Truth, as it is Transcendent, may be Objected: That a Monster is a Being; but a Monster is not answerable to its end; because its end was to be perfect: therefore all beings are not true, that is, answerable to their end: To this I Answer, That a Monster is a true being, in that it answereth to its efficient and material Cause; as in this case, a Child born without a head, is a perfect Natural living being, but is not a perfect Humane being that is, it is imperfect as to its humane body: Nevertheless it is perfect as to its Natural and vegetable being, which sufficeth. Here a further Reply may be made, that God did not only ordain beings to be perfect, as to their Natural Perfection, but also as to their vegetable, animal, and rational Perfection; for his Ordination upon Herbs was, that they should encrease by bringing forth Seed of the same kind; that Beasts should multiply after their own kind. To the clearing of this doubt, we are to observe, that Gods Ordination was related either to the *Species*, or to every individual future being, or to both. It is most probable it was to both, particularly to man, for whose sake the same extended also to other creatures. We are likewise to remember man in his twofold state, to wit, of Integrity and Deficiency. Gods Ordination then upon man was, that he, and all other Animals and Vegetables for his sake, should encrease after their own kind, during mans Integrity. This Ordination upon Gods Creatures is answered and effected by Powers and Dispositions created by him in them: According to which Powers, all Creatures acted. All the Actions of man did therefore depend from his Powers; to wit, his Propagation from his Generative Power, which again was subjected to his Phantasie, and that to his will and understanding: Wherefore as long as his will and understanding did will and understand nothing, but what was perfect, his Phantasie could receive no other Impression, but of Perfections, which could not cause any Error in the Generative power, and therefore had man abided in his entire state, he nor any other Creatures could have generated Monsters. Man having through his deficiency corrupted his Faculties, no wonder if their Acts are also corrupted, and their effects corrupted, and corruptible: Hence then it is beyond scruple, that Gods Ordination did immediately relate to the Powers of all Creatures, and herein are all beings true, and answerable

answerable to their end, and therefore perfect. You may urge an Inconvenience to follow this Solution ; because thereby God seems to be the original cause of Monsters or evil : for if God had conferred perfect powers upon man, man could not have changed them of himself : wherefore God must be supposed to alter them dispositions and faculties. I Answer, That God was not the original cause of this alteration, but man himself through his sin : which therefore was the first impulsive cause. 'Tis certain, that God was the efficient cause of this Alteration of Powers ; yet Gods Act was not evil therein, but good and perfect, because his Justice did require it : for this change upon man was his punishment : If so, none can or will attribute the evil following a punishment of a Malefactor, to him that punisheth, or to the punishment it self, but to the Malefactor, whose Default and Crime was the cause of that evil, which be-fel him after his punishment.

IV. *Austin* in the 5th. Chap. 2 Book of his *Soliloquies* states the Description of *Truth*. Truth is that, which it is ; and in the same Chapter openeth his meaning. Truth is that, which is so in it self, as it appeareth to him that perceiveth it, if he will and can perceive it. Hence do *Hurtad. Disp. 7. Met. Sect. 1.* and *Soar. Disp. 7. Sect. 5.* infer the Nature of Truth to consist in a cognoscibility of a being to the understanding of that, which it is. This Opinion as it is obscure, so it is expos'd to doubts, if not to falshood. The truth of a man doth not consist in my knowing a man to be a man, and that he is no other thing but a man ; for that is a *quidditative* Concept of a man, namely to know him to be a man ; but to know a man to be that, which he was intended for, is the concept of his truth : Wherefore *Soar.* in the same Chapter, doth well recal himself, in asserting that truth is relative to created and increated Knowledge.

Truth doth not superadd extrinssecally (*ex parte actus*) any denomination really distinct from a being, since it is concurrent to the constituting of the nature of a being : for take away truth, and you take away the essence of a being.

V. Falshood is defined by most Philosophers to be that, which appears to be that, ^{wh} it is not. It is strange that falshood, which is not in *rerum natura*, should be defined. It is not in *rerum natura*, because all beings are true. If it can be defined, it is a being, For nothing is definible unless it is a being ; had it been described by a Negative, then indeterminatively we might have perceived it ; as thus, Falshood.

Falshood is, which doth not appear to be that, which it is, or which it was intended for: I say indeterminatively, because we know a (*falsum*) falshood to be a falshood, because it doth not determinate our Concept through its truth; so that this is a privative or accidental knowledge.

CHAP. XVIII.

Of Goodness.

1. *What Goodness is. The Improbation of several Definitions of Goodness.*
2. *The Difference between Goodness and Perfection.*
3. *What Evil is.*
4. *What the absolute active End of Goodness is.*
5. *That Goodness is improperly divided in Essential, Accidental, and Integral Goodness.*
6. *How Goodness is properly divided.*
7. *That the Division of Good in Honest, Delectable, &c. doth belong to Ethics.*

I. **G**oodness is an Attribute of a Being, whereby it is for an end. Many Philosophers do omit the Definition of Goodness, because they can find no distinction between Truth and Goodness. Others define it to be a convenience of a being with the Appetite; which is erroneous, for Goodness is in a being, that is, a partial being, without the Appetite. 2. Goodness is absolute, a Convenience is relative. *Timpl. Chap. 9. of his Metaph. 2 Book,* defines Goodness to be an act of Good, as far as it is good; or is a Quality, from which a being is denominated Good. This is *Idem per Idem*, and *Obscurum per Obscurum*.

II. Goodness is formally distinct from Perfection, because a being, according to what it is good only, is not perfect. Wherefore Goodness is erroneously defined by some to be a Perfection.

III. Evil (*Malum*) is that, which doth not appear to us to be for any End.

IV. The Absolute active End of Goodness is to constitute that, which

which it is. The Passive is to be constituted that, which it is.

V. Goodness is improperly divided into Essential, Accidental, and Integral Goodness; because Good is that, which is essential of it self to a being, and therefore cannot be accidental, as it is opposite to Essential: It may be an Essential part, because it concurs with the rest of the Attributes to the constitution of the Essence of a Being.

VI. Goodness is divisible according to the divisibility of a being, which is either Natural, Animal, or Humane.

VII. The Division of Goodness into Honest, Delectable, and Profitable or Useful, doth not appertain to this Doctrine, but is referred to Ethicks.

CHAP. XIX.

Of Distinction.

1. *The Authors Description of Distinction. That the privative sense of not being moved is a Note of Distinction, whereby the understanding distinguishes a Non Ens from an Ens. That the Positive sense of being moved in another manner, than another Ens moves the understanding, is a Note of Distinction between one Being and another.*
2. *How Distinction is divided. What a real Distinction is.*
3. *What a Modal Difference is.*
4. *That the vulgar Description of a real Distinction is Erroneous.*
5. *That the terms of a Distinction between two or more real beings are requisite both or more to exist.*
6. *That one term of Distinction although in existence cannot be really predicated of another not existent. Oviedo and Hurtado Examined.*
7. *What a formal Distinction is a parte actus, and how otherwise called.*
8. *What a Distinctio Rationis is. How otherwise named.*

I. **D**istinction is an Attribute, whereby a being doth terminate the understanding: Or Distinction is the termination of the

the cognoscent power made by the term of the cognoscibility of a being. Distinction, as it doth concomitate a Positive, is intrinsically identificated with Unity, as it doth privatively imply a Negative, or as much as it doth imply beyond Unity, it is a *Non Ens*, and not cognoscible; for example, *Peter* is cognoscible to me, in that I know him to be *Peter*: the said *Peter* doth terminate my cognoscible faculty by his terminated Accidents or Modes, because beyond them Accidents of *Peter*, I conceive either nothing, or something, which doth not move my understanding by its accidents, as the Accidents of *Peter* did: So that by not being moved in my understanding, or by being moved in another manner, I know that one being is not another, that one being is not nothing. I know that one being is not nothing, because it moves my understanding. I know that one being is not another, because it moves my understanding otherwise than another being doth; which knowledge is called a distinction. A Distinction therefore is nothing else but a *Non ulterior cognoscibilitas rei, sive ex parte Objecti, sive ex parte Actus*; or a *non cognoscibilitas simpliciter*. Wherefore a *non ens* may be properly called *ex parte actus a non cognoscibilitas*.

Distinction here, as it is relative to a being in its transcendence, is, whereby we know it not to be nothing: We know a being not to be nothing, because it moves the understanding terminatively: wherefore that, which we apprehend without, or beyond the term of the Modes of a being, is nothing. Distinction, as it is a Positive, is coincident with Unity, and is not to be referred to it as a different Mode.

II. A Distinction is either *Real* or *Modal*. A *Real Distinction* is, whereby an entire Essence moveth the understanding differently from the entire Essence of another being. What Essence is, hath been declared at large, and thence may easily be conceived, how one Essence differeth from another.

III. A *Modal Difference* is, whereby one Mode of an Essence moveth the understanding differently from another Mode contained in the same Essence: So that a real difference is between things and things, and a modal difference is between Modes and Modes.

IV. A *Real Difference* is generally taken to be between two beings, which can exist asunder; as two essences or Beings: But two Accidents or Modes of one being cannot exist asunder; which notwithstanding

withstanding are counted by them to be really different; wherefore they must either mistake in their Definition, or in supposing two Accidents inherent in one essence, to be really distinct. Besides, this is rather a property of a real difference, and not its Description or Definition; for were it derived from the essence of a being, it would be a Definition; but since it is deduced from Existence, which is only a Property of a being, it is no Definition or Description.

V. The Terms of a Distinction between two or more Real Beings are Requisite and Necessary both or more to exist. I prove it in this Proposition; *Bridget* is not *Mary*: We cannot say, that *Bridget* is not *Mary*, unless both existent; for the species of *Bridget* moving the understanding in a distinct manner, and *Mary* moving the Intellect in another manner, are two terms of distinction: Now how can these two terms move the understanding as two real beings, unless existent? You may say, that although *Bridget* is not existent, yet she hath existed, and by that species she moves the understanding: That is impossible; For how can *Bridget* move the understanding from without, and she not be existent from without? 2. If this improper motion were granted, yet *Bridget* not being in existence, we cannot say, *Bridget* is not *Mary*, but we may say, *Bridget* was not *Mary*; for *is* denotes a presence, and an actual existence.

VI. We cannot really predicate one term of Distinction, although in existence, of another not existent: which if otherwise we do, then that term, which is not existent, is equivalent to a *non ens*: as is evident in this Enuntiation; *Paris* is not *Troy*. Here *Paris* doth really move our understanding from without, but *Troy* doth not; for it is not in *rerum natura*. Wherefore these two cannot be predicated really of one another. But if each considered as objective, then they may objectively be denied of one another. 2. *Paris* taken as a real being, and enunciated of *Troy* as no real being, amounts to a *non ens*, and is the same, as if you said, in stead of *Paris* is not *Troy*, *Paris* is not nothing. In the same sense is a *Chimera* taken for a *non ens*, because it doth not move the understanding from without: as, a man is not *Chimera*, that is, a man is not nothing, or a *non ens*.

VII. Authors have involved themselves in such absurdities, and strange terms, that they do thereby render themselves and their Opinions inexplicable; whereas there is no ordinary capacity, but may easily attain to the understanding of these *Metaphysics*, which all

along I have demonstrated by sense: What barbarous discourse do we find in *Hurt.* and *Oviedo.* upon this very Subject; which for to unlock, I have studied to unfold the Doctrine of *Precision* and *Distinction*, in a plainer Discourse.

Oviedo makes it a great difficulty to distinguish the concept of *Peter* and a *Horse*: and no wonder, if it proveth so unto him, since he proceeds upon an obscure foundation of distinction: Neither can he light upon any at all; For in his *Met. Contr.* 4. P. 1. he writes thus; Some say, that the Objective Concept, by whose force this positive being is not another formally, doth imply a Negative: But *Hurtado*, and many others teach better, that the same positive essence of a being is signified in a Negative manner. I have said more of this *Contr.* 3. Where I have proved that or this being not to be another: as *Peter* not to be *John*, doth imply a positive Concept of a being, without importing formally any other Negative: Thus far *Oviedo*. Here you have the foundation of Distinction stated by the forementioned Author; but if narrowly examined, will prove no foundation. And as to the first Opinion, which is, That the Objective Concept, &c. What force is it, which a Positive being hath, whereby it is not formally another? This is not propounded by them, and therefore it is no Foundation. The Answer to this, I have plainly and briefly set down in the first *Paragr.* of this *Chapt.* 2. How can an objective Concept imply a Negative? The Resolution of this is also by them omitted. The Second Opinion asserts, That the same positive Essence of a being is signified in a Negative manner. This is no ground of Distinction; because a positive being is signified negatively: therefore it is distinct. This is *Idem per Idem*; a positive being is signified negatively, therefore it is a Negative, or is distinct. *Oviedo* himself reaches somewhat nearer to the truth of the Matter: He saith, that for a being not to be another being, doth imply a positive concept; and so it doth: But how, or in what manner, he omits. It is by moving the Intellect (as I have proved before) in a sundry manner, or by several Modes. But to return to the Resolution of the Distinction proposed: Wherein *Peter* is distinct from a *Horse*. *Oviedo* imagineth, that *Peter* is distinct from a *Horse* through his Unity: which doth distinguish him from another, in that it doth represent that it is not that unity. This is a Mistake; for *Peters* single unity doth only make him distinct from a *non ens*, and not distinct from another being, unless that

that being moves the Intellect about the same time one after another : wherefore two unities are compared in the Intellect, which being different in their *Idea*, cause a distinction between themselves: For how can I deny, that one unity is not another, unless both conceived and compared to another.

VIII. That, which is a *Real distinction a parte objecti externi*, of *Rei*, is named a *formal distinction a parte actus* : It is named formal, because the Intellect conceiveth a distinct form of each being from another, and thereby formes the Definition of it, which is nothing else but the explication of the form of a being.

IX. The same, which is denominated an objective distinction *a parte objecti interni*, is signified *a parte actus*, by a (*distinctio rationis*) distinction of the mind, whereby the mind doth distinguish internal Objects otherwise, then they do exist really or without, or otherwise, then they move from without. Here I may seem to contradict my self, although I do not, in saying here, that the Intellect doth, or may understand Objects from within, different from them which move from without : and in another preceding place of this Book, I concluded, that the understanding could not understand or conceive any being from within, but what was like to beings from without. To reconcile these two places ; you are to observe, that an *Objective Being* may be like to a *Real Being*, either in some of its Modes, or in all : If in all, then the being from within is like to the whole essence of the being from without ; but if in some, then them some are unlike to the whole, in the same manner as a part is unlike to the whole. Wherefore in this, the understanding may perceive an Object from within distinctly from an Object from without.

2. The understanding cannot perceive any being, but what is like to an entire being, or one or more Modes of a being from without.

3. The understanding may also conceive some modes of one being, and some of another, which modes both united, cause a distinct objective being in that union, to what they were from without in disjunction.

4. In this example the understanding cannot perceive but what is like to Externals, for each of them modes are like to some one mode or other of beings from without, although here they are disunited, yet are united in the understanding. How modes or Objects are or may be united in the understanding, I have shewed in the 7th. Chapter of this Book. As for other divisions of Distinction

tion may be easily collected from what is contained in the foregoing Chapter.

CHAP. XX.

Of Subsistence.

1. *What Subsistence is. What it is to be through it self, from it self, and in it self.*
2. *That a Nature cannot be conservated by God without Subsistence. That the Transubstantiation of Christs Body and Blood into Bread and Wine, according to the supposition of the Papists, is impossible. Oviedo's Argument against this Position answered.*
3. *The kinds of Subsistences.*
4. *What Termination is.*
5. *What Perfection is.*

I. **S**ubsistence is an Attribute of a Being, whereby it is through it self. There are many Locutions of this Nature; which, although they seem to be the same, yet are much different; as, *to be from it self, through it self, and in it self*. *To be from it self*, denotes a non-dependance from any pre-existent cause: and according to this sense God is only subsistent, that is, is a *Being from himself*. In this Acception did *Cartesius* very well deny, that a Substance could not be an univocal *Genus* to God and his Creatures. *To be through it self*, expresseth a being consisting of its own parts, and not of anothers parts; and in this sense are all beings subsistent or Substances. *To be in it self*, signifieth a singleness of Existence, which is to consist only of a single unity, and of no parts; so is God said to be in himself. Did a being consist of parts, then it must be said to exist in its parts; for it would be very improper to say, that a compound being did exist in it self: But a being consisting of no divisible parts, we are compelled to say, that it is in it self.

II. A Nature cannot be conservated by God without Subsistence. It is contradictory: For take away the Subsistence of a being, you take away its parts; for Subsistence is nothing else, but the essence of a being, through or in its Parts. This is a very necessary Tenent, for to defend.

send this Assertion, viz. That the Subsistence of the Bread cannot be the corporal Subsistence of Christ; and therefore it implieth a Contradiction, that Christ should be really and essentially changed in the Subsistence of Bread, and the essence of both remain. The *Lutherans* have stated a more probable Opinion, that Christ's Substance was united to the Substance of Bread: which is something less erroneous than the other. *Oviedo* strives to prove the contrary, in *Contr. 6. P. 6.* His Argument is this: Nature is before Subsistence in respect of causality: Therefore Nature is understood to be existent, before Subsistence is understood. I deny the Antecedence, which is palpably false; for take away the Subsistence of a thing, and you destroy the being of it: and state a Subsistence, and you must necessarily state a being.

III. Subsistence is divisible (as all other Attributes of a Being) in a first Subsistence, and in a second Subsistence. The first is proper to Individuals and Singulars: the Second to Universals.

IV. Termination is a Property of a Being, whereby it is terminated. Termination is in all beings, in Spiritual and Natural beings: in God, and in his Creatures.

Gods Termination is not to be terminated, and therefore he is Infinite. A *Non Ens* hath no Termination, wherefore Authors say very improperly, that a *Non Ens* is infinite. All other beings are terminated, and therefore are finite.

V. Perfection is a Property of a being, whereby it is completed with all, or in all, belonging to the Constitution of its Essence.

CHAP.

CHAP. XXI.

Of remaining modes of a Being.

1. *What Quantity is.*
2. *What the Kinds of Quantity are.*
3. *What Quality is.*
4. *What Relation is.*
5. *What Action is.*
6. *What Passion is.*
7. *What Situation is.*
8. *What Duration is.*

I. **Q**uantity is an Attribute of a Being, whereby it hath Extension of Parts.

II. Quantity is either Formal and Immaterial, which is the extension of the Form, beyond which it is not, and within which it acteth: or Material, which is the Extension of a material Being.

III. Quality is, whereby a being doth act; as from a Cause.

IV. Relation is, whereby one being is referred to another.

V. Action is, whereby one being acteth upon another, as through a meanes.

VI. Passion is, whereby one being receiveth an Act from another.

VII. Situation is, whereby a being is seated in a place. A Place is, which doth contain a Being.

VIII. Duration is, whereby a being continueth in its Essence.

CHAP. XXII.

Of Causes.

1. *What a Cause is. That the Doctrine of Causes belongeth to Metaphysics.*
2. *Wherein a Cause and Principle differ.*
3. *What an internal Cause is. What Matter is.*
4. *What a Form is, and how it is divided.*
5. *What an external cause is.*

I. **A** Cause is, whereby a Being is produced. It doth appertain to *Metaphysics* to treat of Causes; for else it would be no Science, which requires the unfolding of a being by its Causes. *Ramus* did much mistake himself, in denying a place to the Doctrine of Causes in this Science, and referring it altogether to *Logick*: 'Tis true, that the Doctrine of Causes may conveniently be handled in *Logick*, as Arguments by which Prooves are inferred: yet as they are real, and move the understanding from without, they may not; for *Logick* is conversant in Notions only, and not in Realities.

II. A Cause differeth from a Principle, or is *Synonymous* to it, according to its various acception. In *Physics* it is taken for that, whose presence doth constitute a Being; and in that sense it is the same with an internal cause, to which a Cause in its late extent is a *Genus*, and consequently is of a larger signification.

A Principle sometimes denotes that, whence a being hath its Essence, or Production, or whence it is known. In this sense did *Aristotle* take it, in the 5th. Book of his *Met. Chapr. 1.* Whereby he did intimate a threefold Principle; to wit, a Principle of Constitution, Generation, and of Knowledge, or of being known. A Principle, as it is received in the forementioned sense, is of a larger signification, then a Cause.

It is usually taken for a word *Synonymous* to a Cause. In this Acception is God said to be the Principle (that is, the Cause) of all Beings.

III. A Cause is either Internal or External.

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An Internal Cause is that, which doth constitute a Being by its own Presence.

An Internal Cause is twofold. 1. Matter. 2. Form.

Matter is an internal cause, out of which a being is constituted. So earth is the Matter of man, because a man is constituted out of Earth.

Matter is remote and mediate ; which is, out of which the nearest and immediate matter was produced or constituted ; or nearest and immediate, out of which a being is immediately constituted, For example ; The nearest matter of Glass is Ashes : the remote is Wood, which was the Matter of Ashes. But this Distinction doth more properly belong to *Logick*.

IV. A Form is a Cause, from which a being hath its Essence.

A Form is remote or nearest. A remote form is, from which a being consisting of remote Matter, had its Form.

The nearest Form is, from which the nearest Matter hath its Essence.

The remote matter is either first or second. The first is, out of which the first being had its Essence.

The Second is, out of which all other beings had their essence.

A Form is divisible into the same kinds. The first Form was, from which the first being had its essence. The second, from which all other beings have their essence : These Divisions are rather *Logical* than *Metaphysical*.

V. An external Cause is, by whose force or vertue a being is produced. The force whereby a being is produced, is from without : for a being hath no force of it self, before it is produced : therefore that force, whereby a being is produced, is necessarily from without. This Cause is only an efficient Cause.

Other Divisions of Causes I do wittingly omit : because some are disagreeing with the Subject of this Treatise, and belong to another Part of Philosophy : as, to treat of the first cause, belongeth to *Pneumatology* : of final Causes, to *Morals* : Others are very suspicious.

CHAP.

CHAP. XXIII.

Of the Kinds of Causes.

1. *The Number of real Causes. That a final cause is no real Cause. The Causality of Matter and Form.*
2. *The Division of an Efficient.*
3. *That an Efficient is erroneously divided in a procreating and conserving Cause.*
4. *That the Division of a Cause into Social and Solitary is illegal.*
5. *That the Division of an efficient Cause into Internal and External is absurd.*
6. *That all Forms are Material.*
7. *That there are no assistent Forms.*

I. **T**Here are only three real Causes of a Being ; a Material, Formal, and Efficient Cause. Wherefore a Final cause is no real Cause. I prove it: A real Cause is, which doth really effect or produce a Being: But these are only three: *Ergo*.

2. A Final Cause doth not cause any effect concurring to the constitution of a being, as each of them three forementioned do: for matter causeth an effect by giving her self, out of which a being may be constituted: A Form doth produce an effect, by giving through her presence unity, & distinction from all others, to Matter. An efficient Cause effecteth by educing a Form out of the matter, and uniting it to the Matter: Which three causalities are only requisite to the production of a compleat being; and they constituted *in actu*, constitute a being at the same instant: If so, what effect doth a final Cause then produce? Certainly not any contributing to the essential constitution of a being: These three being only necessary, any other would be frustaneous. Possibly you will object, that the final Cause moveth the efficient. Suppose I grant that, it doth not infer, that it concurs to the real and essential production of a being. The causality, which it exerciseth, is in contributing *per accidens* to the constitution of a being: which if only so, it doth not appertain to this place; neither can it be equally treated of with Causes, which do act *per se*.

II. An End moverh the efficient : An efficient is either Natural or Moral.

Natural efficientes are moved necessarily, or act *e necessitate Naturæ* : Hence we say, a Cause being *in actu* (to wit, a Natural Cause) its effect is likewise necessarily constituted *in actu*. It is not so with a final Cause; for that may exist without producing an effect.

All Natural Causes move for an end *per accidens*, in that they answer the Ordination of the Creator, who hath created all things for an end; which accordingly act for the same out of Necessity of Nature.

Moral Efficientes are moved by an end : Yet it is not the end, which produceth the effect, but the efficient it self.

You may demand, to what Science or Art it belongeth to treat of final Causes ?

I answer, That they are treated of in *Logick*, and *Moral Philosophy*, but in a different manner: *Logick* discourseth of final Causes as Notions, thereby to direct the understanding in enquiring into the truth of things : and *Ethicks* treats of them, as they are dirigible to Good and Happiness.

III. An Efficient Cause is erroneously divided in a procreating and conserving Cause. A procreating cause is, by whose force a being is produced. A conserving cause is, by whose vertue a being is conserved in its Essence. I prove that this Division is not real, but objective only. The dividing Members of a real division, must be really distinct from one another. But these are not really distinct, &c. *Ergo*. The *Major* is undeniable. I confirm the *Minor* : All beings are conserved by the same Causes, by which they were procreated : Therefore really the same. I prove the Antecedence. Nutritive causes are conservant causes. But Nutritive causes are the same with Procreative causes : *Ergo*. The *Minor* is evidenced by a *Maxim* : *Iisdem nutrimur, quibus constamus*. We are nourished by the same causes, by which we do subsist, or have our Essence. Wherefore Nutritive or Conservant Causes are really (for by Nutriture we are conserved) or a *parte rei* the same ; differing only objectively a *parte actus*.

Here you may answer, that these Instances are of material causes, but not of Efficientes. To this I reply ; That no cause can be a conservative cause, but a Material Cause. As for an Efficient cause, I prove it to be no conserving cause. That, which conservateth a being,

being, must conserve its essence : namely, Matter and Form : but Matter and Form are conserved only internally by apposition of that, which is like to what was dissipated, or which is like to themselves. Wherefore an Efficient can be no conserving cause, because it acteth only externally or from without.

A being might be conserved externally, if its impairment did befall it from without, that is, from an external Agent ; which is only accidental to it. An efficient then may Logically be called a conservative cause *per Accidens*.

IV. An Efficient is likewise divided in solitary, and social. A solitary Efficient is, which produceth an effect alone, or without the assistance of another cause. A social cause is, which produceth an effect jointly with another : As, two Watermen rowing in one Boat, are social causes of the moving of the Boat through the water. This Division is no less illegal then the other. I prove it : All beings act alone and in unity, as far as they are Causes ; and although two or more concur to the effect of a being, yet they two act formally, but as one, and their *Ratio Agendi* is one ; *Ergo* formally they are but one, as far as they are Causes yet in the foresaid instance, as they are men, they are two, which duplicity is accidental to a cause.

The same Argument may be urged against the division of a cause in a cause *per se*, and a cause *per Accidens*, in univocal and equivocal, in universal and particular.

V. An Efficient is Internal, or External. An Internal Efficient is, which produceth an effect in it self. An external Efficient is, which produceth an effect in another. This division is stranger then any of the rest : The strangeness consisteth in this, that thereby a being is capable to act upon it self, and consequently upon its like : Which if so, what can it effect, but that, which was before ? It cannot produce a distinct being, because it doth not act distinctly, but identificatively : This granted, infers, That the Soul being the internal cause of its Faculties (as they affirm) cannot produce any thing, but what is like to it self : Consequently, that the Faculties are identified with the soul, and thence that a Substance is an Accident, and an Accident a Substance. 2. A Substance acting upon it self, that is, upon its (*sibi simile*) like (for what is more like to a Substance, then it self) produceth a distinct effect, and not its like ; which is another absurdity following the forementioned Division. It will also follow hence, that a substance doth act immediately

ately through it self, which is against their own Dictates. To remove this last Object on, they answer, that a Substance may, or can, and doth act immediately through it self by emanation, but can or doth not act by transmutation. They describe an emanative action to be, whereby an effect is produced immediately, without the intervent of an Accident. This description doth not distinguish Transmutation from Emanation; for transmutation is also, whereby an effect is produced without the intervent of an Accident; and so transmutation may be as immediate to its Agent as emanation. If there is any difference, it is this, in that emanation is an action not terminating or influent upon any other being, but in and upon it self. Transmutation is the Termination of its Influence upon another being. Pray tell me, why emanation may not be as properly called transmutation, as not? for there is no effect, but which is different from its cause, and changed by its cause: For if it is not changed, it remains the cause still; *Ergo* Emanation is also a Transmutation. The Faculties of the Soul are said to be emanative effects; *Ergo* they must be its understanding Faculty only: for this only doth not terminate in any other being, but in it self: As for the other Faculties, to wit, vital and sensitive, they are effects of the soul terminated in other beings; *Ergo* These are no emanative Actions, as they affirm them to be. That, which hath the most probability of being an emanative action, and distinct from transmutation, is the understanding faculty of the Soul. Neither is this action distinct from Transmutation. That, which doth change the soul, is an Object; but the soul of it self alone doth not act or cannot act upon it self, unless it be changed by an Object; for were there no Object, the Souls Rational Faculty would be nothing and frustraneous; wherefore it is generally held, that Angels, when created, had also notions or *species* (which are objects) concreated with their understanding; *Ergo* emanative actions are also transmutative.

All matter is transient: Wherefore the division of matter in transient and immanent is erroneous. Transient matter is, out of which a being is constituted by transmutation; so bloud is the transient matter of flesh.

Immanent matter is, out of which a being is constituted without any transmutation; as Wood is the immanent matter of a Ship. Here one part of the division is referred to a Natural Production, the other to artificial. How is this then a regular distribution, since

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its dividing Members ought to be of one *Species* or kind? The same Improbation may be applied against the distribution of matter in sensible and intelligible; which distinctions are accidental to matter; and therefore may be justly omitted; for we ought to insert nothing in a Science, but what doth essentially relate to its Subject: Hence *Aristotles* Precept is, in 1. B. of the Parts of *Liv. Creat. C. 3.* Διαπερὶν καὶ τοῖς ἐν τῇ οὐσίᾳ καὶ τοῖς συμβεβηκόσι, that we ought to divide a being by them parts, which are contained in its essence, and not by its Accidents.

The division of Matter in Metaphysical and Physical may be rejected upon the same ground.

These divisions, as they are objective, appertain to Logick, where only second notions are treated of, and are very useful to the directing of Reason.

VI. Forms are divisible in material and immaterial. If material is understood to be that, which doth inhere in matter (which is its most frequent and ordinary acception; for most Philosophers take it in that sense) then all worldly beings are material; what being is there, but which doth inhere in Matter? You may say, mans soul. The soul of man according to this acception, is material. But if you take immaterial for that, which can or doth exist out of matter, then there are immaterial forms. Neither can this be naturally: for a Natural Form is, which giveth an actual specification and numerication to matter: If so, how can a form give an actual Specification and numerication to matter, when it is not united to it? I prove that the Form giveth an actual specification and numerication to matter. *Forma dat esse (i. e. Specif. & Numer.) non posse esse materia.* A Form giveth a being, not a power of being to Matter. For matter hath the power of being from it self, and not from the Form. This is true: for most *Peripateticks* hold, that *Potentia* is essential to matter. The Soul of man, when once freed from its tie to the body, ceases to be a Form; but therefore doth not cease to continue a being. So that I conclude, there are immaterial beings, but no immaterial Forms. It is ridiculous to doubt, whether the Soul of man, when separated, hath an Appetite or Inclination to its Body, or to that matter, which it did once informate: because the soul in its separated estate is a compleat and perfect being, and doth not need a Body: neither is the Soul a Form in that state; Wherefore should it then have an Appetite to its Body? Such an Appetite

Appetite would be in vain. You may answer, that it wanteth a Subject to inhere or subsist in. I grant it, and therefore it subsisteth in God.

VII. A Form is improperly divided in an assistent and informing Form; because one being is satisfied with one Form; for had it two forms, it would be a double being. 2. That, which they intend by an assistent form, is coincident with an Efficient Cause.

CHAP. XXIV.

Of the Theorems of Causes.

1. That a Cause and its Effects are co-existent.
2. That there are but three Causes of every Natural Being.
3. That there is but one Cause of every Being.
4. That all Beings are constituted by one or more Causes.
5. That all Causes are really univocal.
6. That all Natural Causes act necessarily.
7. That the Soul of a Beast acteth necessarily.
8. That all Matter hath a Form. That Matter is capable of many Forms.

I. **A** Cause and its Effect are existent at one and the same time. This Theorem is received among most Philosophers, who render it thus; *Posita Causa, ponitur Effectus*. The Cause being stated, that is, reduced into action, its Effect is also stated, or produced. The Reason depends upon their relation one to the other, to whose *Relata* it is proper to exist at one and the same time, according to that trite Maxim, *Relata mutuo sese ponunt & tollunt*. Relations do constitute and abolish one another.

II. There are three Causes of every Natural Being, whereof, one reduced to Action supposeth the others also to be reduced to action. The Proof of this is demonstrated by the same Axiom, by which the next forementioned was inferred:

III. There is but one Cause of all Beings. A Cause here is taken in a strict sense, for that, which produceth an effect essentially and really

really distinct from it self: In this Acception is an efficient the only cause of all Beings. Matter and Form are no Causes, according to this Interpretation, but Principles; because they do not constitute an effect essentially different from themselves. A Cause sometime is taken in a strict sense, for that, which produceth an Effect different from it self *modally*; and so there are two; to wit, Matter and Form. Lastly, A cause, as it signifieth in a middle signification, participating of each acception, comprehends a triplicity of causes; *viz.* An Efficient, Matter, and Form.

IV. All beings are constituted by one or more Causes. God is of himself, and not from any other, as from an efficient cause; and consisteth of one pure formal cause. By formal Cause, understand an immaterial being. Angels are constituted by two Causes; namely, by an Efficient and a Form. All other Beings are constituted by more.

V. All Causes are univocal. This is to be understood of Efficients only. Whatever Effect a Cause produceth, it is like to its Form, and is formal only: For it cannot generate matter, that being created. Wherefore it cannot produce any thing else, but what like to it self, and consequently produceth alwaies the same effect; whereas an equivocal cause should produce different effects. You may demand, why it hapneth, that many effects are different, as we observe in the Sun, which by its heat, doth produce Vegetables and Animals, which are different? I answer, that the Difference doth result from the diversity of the Matter, upon which it acteth, and not from the causality; that being ever one and the same. The diversity of Effects is accidental to the Efficient, and therefore not to be allowed of in Sciences.

VI. All Natural Causes act Necessarily. Hence derives this Maxim; *Natura nunquam errat*: Nature doth never erre; because she acts necessarily. Against this Maxim may be objected, that Nature erreth in generating a Monster. This is no Errour of Nature: It might rather be imputed an Errour, if, when it should produce a Monster, it doth not. That, which acts after the same manner at all times, doth not erre; But Nature doth act in the same manner at all times; *Ergo* she doth never erre. I prove the *Minor*. If she acts differently at any time, it is in a Monster: But she doth not act differently in a Monster; as in the example forenamed, of a Dog without Legs, she doth through the Efficient cause educe a
form.

form out of the matter, which she extendeth according to the extent of the subjected matter ; the matter therefore being deficient in quantity, it is accidental to Nature, if thereby a being is not brought to the likeness of its *Species*.

The Soul of man may be considered, either, 1. As a Natural Cause ; and so it acteth also necessarily, in giving a Being and Life to the Body: For as long as it abideth in the body, it cannot, but give Life to its Parts. 2. As it is above a Natural Cause, in that it hath a power of acting voluntarily without the Necessity or Impulse of Nature.

VII. The Soul of a Beast doth act necessarily, and by Instinct of Nature. This Conclusion may seem to contradict, what is set down in the precedent Paragraph ; containing, that to act necessarily, is to act alwaies in the same manner : whereas Beasts act in sundry manners, and produce various Effects : as, sometimes they feed, other times they run, or lie down ; which are all various acts, and performed in various manners. These Acts are called spontaneous, which generally are received as differing from Natural and Voluntary, and constituting a Mean between Necessary and Contingent, although improperly ; for there is no Mean between Necessary and Contingent ; because whatever is Necessary, cannot be Contingent, and whatever is Contingent, cannot be Necessary. These Acts must be either the one, or the other. They are not contingent, for then a Beast, as a Beast, could not act necessarily. Since then it is more evident, that they act necessarily at most times, it is an invincible Argument, that they do not act contingently. This by the way ; I return to the forementioned Objection, and to reconcile them seeming Contradictions : I say, that, 1. Nature doth act alwaies in the same manner, through the same Principles, and upon the same Object. 2. Nature doth not act alwaies in the same manner, through different Principles, and upon different Objects : For example ; *Opium* raises fury in a *Turk*, and layeth it in an *European* : These are different Effects, because the Objects are different. *Coral* is heavy and weighty from its Earth, and thence proveth obstructive in the body of man: *Coral* is also informed by a sublime spirit, through which it is aperitive and cordial. The difference of these effects proceeds from the difference of Principles. I apply this to the Acts of a Beast, which are different, because they proceed from different Principles : Nevertheless them Acts
are

are alwaies the same, as far as they proceed from the same Principles, although different from one another. But as for a voluntary Principle, that acteth effects different from it self, as it is one and the same Principle.

The Proprieties of voluntary are,

1. To act different Effects through one and the same Principle.
2. To have a power of suspending an Action.
3. To act with Election.

The Proprieties of Naturals are,

1. To act the same Acts through the same Principle.
2. To act alwaies, and without necessarily, without having a power of suspending its Action.

3. To act through an Impulse of Nature. A Brute doth feed from an Instinct of Nature, and therefore cannot but obey it, at the same Instant of that Instinct, provided there be food for it to feed upon. Neither can it suspend that Action for a moment, but as soon as it is impelled, it moveth towards its food. This is evident in a Dog; if he be very hungry, and have a bone in his sight, he will move towards that bone, although you beat him never so much. A Brute moveth locally either to avoid pain, or to search for food. If a Beast move after it is filled, it moveth to avoid pain, (and in that it answereth to the Impression of Nature, whereby all natural beings move to avoid that, which is inconvenient to them, or disagreeing with them) which it feels in lying long, through the weight of his bones, one pressing the other, and therefore moves, to ease himself, either by standing, going, or running. He goeth or runneth so long until he is pained by it; and then to ease himself, and to avoid that pain, he lieth down again.

VIII. All Matter hath a Form: because it would be nothing, if it had no Form: For from thence it is thought to receive unity; now without unity a being is no being.

All Matter hath but one essential Form; for had it two essential Forms, it would be two Beings, and consequently no Being; because whatever is not one, or is more then one, is no Being.

The Form giveth Unity, and Distinction to the Matter.

Matter is capable of many Forms successively, that is one after another: as for example; The Matter, which is in an Herb, is capable of receiving the form of Chyle, of Bloud, and of Flesh:

Or if burnt, of Ashes ; if then melted, of Glafs.

In like manner man receiveth first the form of a Plant, afterwards of an Animal or sensible Living Creature, lastly, of a Man.

A Form doth act without intermission : For should its Action cease at any time , at the same moment would the Form cease also with it.

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THE
DOCTRINE
AND
CONTROVERSIES
OF
POVVER.

THE FIRST PART.

The third Book.

THE
DOCTRINE
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The Doctrine and Controversies of Power.

The Third Book.

CHAP. I.

Of Powers, according to the Peripateticks.

1. *The Opinion of the Peripateticks touching the Soules Action. That according to the same Opinion, a Substance is said not to act immediately through it self, but through superadded Powers.*
2. *That a Substance acteth through as many different Powers, as it produceth different Acts.*
3. *That the said Powers are really and formally distinct from the essence of the Soul.*
4. *That Powers are concreated with the Soul, and do immediately emanate from her Essence.*
5. *That immaterial Powers are inherent in the Soul, as in their Agent; Material ones in the Matter, as in their Subject.*
6. *That Powers are distinguished by their Acts and Objects. The Authors Intent in treating of the Faculties of the Soul.*

IT is an universal Truth, That all Essences which have a Being, have it for an Operation: Wherefore there is nothing idle within the Creation, but all its parts from the Center of the Earth, to the Circumference of the Heavens, are found to perform some Action or other without Intermission;

million ; which ceasing, the essence, from whence it issued forth, ceaseth with it: When fire and Water cease from diffusion and concentration, then their being ceaseth withal. Hence it is evident, that the Soul of man, since it hath a being, performeth an operation, or Action, the which, according to the sense of the *Peripatetick* School, is impossible to be effected through the substance of the Soul ; their Reason being grounded upon that Dictate of their great Master, *viz.* No substance acteth immediately through it self, but by a superadded power. This they do illustrate by this Instance ; The Elements do not act through their Substance or Form, but through their heat, coldness, &c. which are qualities distinct from their Form and Substance. Hence doth *Aristotle* conclude, 1. That nothing is contrary to a Substance, but to its power and qualities : because a substance cannot act through it self. 2. That no Substance can be affirmed to be more or less a substance then another, that is, no substance can be either remitted or intended : for example, one fire cannot be said to be more a fire, then another, because it doth cast a greater heat, which proceedeth from its stronger power, and heating quality, and not from its being more a fire then another fire is : but one fire may be said to be hotter and greater then another, which happeneth (as I hinted before) through the intention of its quality, and access of quantity.

II. A Substance being adorned with that variety of Accidents, it is probable, that Nature hath bestowed them for Action (say they) and not for nought.

They do not only allow one power to a Substance, which might suffice, but a multitude ; yea, as many as there are varieties of acts, specifically differing from one another, effected through a Substance.

Aver. Met.

7. c. 3.

Tho. A. p. 1.

q. 77. 1.

Art. c. 1.

Herv. qual.

1. q. 9.

Apol. de an.

q. 7.

This leaneth upon an Argument of theirs, thus framed : The Soul being indifferent to divers Acts, there must be something superadded, by which it is determined to produce certain Acts. Neither is this Opinion deficient in Authorities of Learned Philosophers, *Averrhoes*, *Thomas Aq.* *Albertus magn.* *Hervaeus*, *Apollinaris*, and others consenting thereunto: *Dionysius* also in his Book concerning divine Names teacheth, that Celestial Spirits are divisible into their Essence, Virtue or Power, and Operation.

III. The said powers are not only affixt to the Souls Essence, but are also formally and really distinct from it. They are perswaded to a formal distinction; because else we might justly be supposed to will, when

when we understand, and to understand, when we will ; or to tast, when we smell, and so in all others. They are moved to a real distinction, by reason that all powers in a Substance are really distinct from its Matter and Form. Weight and Lightness, which are Powers inherent in the Elements, whereby they encline to the Center, or decline from it, are not the Matter of Earth and Fire, nor their forms, and therefore they are really distinct from their Essence.

IV. These Powers are concreated with the soul, and do immediately flow from her Essence. An Argument whereby to prove this, is set down by *Thom. Aq.* among his *Quæst.* Powers are accidental forms, or Accidents properly belonging to their Subject, and concreated with it, giving it also a kind of a being: It is therefore necessary that they do arise, as Concomitants of its Essence, from that, which giveth a substantial and first being to a Subject. *Zabarel de Facult. an. Lib. 1. Cap. 4.* sheweth the dependance of the powers from the Soul to be, as from their efficient cause, from which they do immediately flow, not by means of a transmutation, or Physical Action, which is alwaies produced by motion. Others add, that the Soul in respect to its faculties, may be also counted a Material Cause, because it containeth her faculties in her self: and a final Cause, the faculties being allotted to her, as to their End.

*Thom. p. 1.
q. 77. Art. 6.*

V. Immaterial Powers are inherent in the Soul as in their agent or fountain. Material Faculties, as the Senses, Nourishing Faculty, and the like, are inserted in the Matter; yet so far only, as it is animated: Hence doth *Aristotle* call the latter, Organical Powers, from their inherence in the Organs.

VI. Powers are distinguished through their Acts and Objects, to which they tend, and by which they are moved to act. For example: Any thing that is visible, moveth the sight, and is its proper Object, which doth distinguish it from the other Senses and Powers, which are moved by other Objects. Thus far extends the Doctrine of *Aristotle* touching Powers, which, although consisting more in Subtilities, and Appearances, then Evidences and Realities, notwithstanding I thought meet to expose to your view, since most Modern Authors do persist in the same, and thence to take occasion to examine the Contents thereof, in these brief subsequent Positions. By the way, I must desire the Reader to remember, that the distinction of Powers from their Subject, is commonly treated of in the Doctrine of the Soul, and solely applied to it, there being not the least

least doubt made of it elsewhere : Wherefore I have also proposed the same as applicable to the Soul, but nevertheless shall make further enquiry into it, so far as it doth concern all Matters in general.

CHAP. II.

Of all the usual Acceptions of Power.

1. *The Etymology of Power. The Synonima's of Power.*
2. *The various Acceptions of Power.*
3. *What a Passive Natural Power, and a Supernatural Passive or Obediential Power is.*
4. *Various Divisions of Power.*

I. **T**He unfolding the name is an Introduction to the knowledge of the thing it self: and therefore it will not be amiss to give you the Etymology of Power. *Δύναμις, Power*, is derived from *δύναμις, I can, or have in my power*: So *Potentia* from *Possūm*, signifying the same. *Power* in *English* hath its original from *Pouvoir* in *French*, noting the like, viz. *to can or be able*. Power, Vertue, Might, Strength, and Faculty are *Synonima's*, or words of one Interpretation: Thus oftentimes we make enquiry, what Vertue, Strength, Power, or Faculty hath such or such an Herb? that is, what can it effect?

II. The Acception of the word *Power* is very ambiguous. 1. Sometime it is understood passively, for a disposition, whereby a Substance is apt to receive the strength of an Agent. 2. Actively, for that, through which a being can act. 3. Its signification doth vary much, according to the Subject, which it doth respect: as, when we say a being in power, that is, a being, which is not actually, but yet may or can be. So likewise a Cause in power is, which doth not actually produce an effect, but which can produce one.

Zabarel remarketh a double Acception of Power. 1. Improperly it is taken for a Power, which is joyned to its Act: Thus we say of a man, who actually walketh, that he can walk. 2. Properly it is attributed only to a Power, which doth precede its Act: Thus we say a man is a *Logician*, when he can be one.

III. A Passive Power, as it is capable to receive a Natural Act, is called a disposition: As it may receive a Supernatural Act, that is,

an Act from a Supernatural Cause, it is then named an Obediential Power. The Power which was inherent in *Lots* Wife of receiving the Form of a Pillar of Salt, was an Obediential Power.

IV. Again those Powers are either Natural, Violent, or Neutral. A Natural Power is such, which is agreeable to its Nature; as the power in Fire of ascending is Natural to it. A violent power is, which is disagreeing to the Nature of its Subject; as, in fire, there is a violent Power of moving downward. A Neutral power is, which is neither the one or the other, but participates of both. Such is the power in fire of moving circularly.

A Power may be understood either for a *Logical* power, which is nothing else, but a *non-repugnance*: or, for a *Physical* power, which is the same with a Natural disposition: or, for a *Moral* Power, which is nothing else but the Will. Lastly, in *Metaphysics* it is that, which is presupposed to be in an *actus entitativus*.

There is also mention made in Philosophy, of an *Objective* Power, which is not much different from a *Non-repugnance*, or a *Logical* Power, but expressly it is a Possibility of existing in a being, which the understanding doth give it before its Existence.

Many more Additions of Power might be proffered: as, that a Power is either Created or Increased; Accidental or Substantial; Essential or Modal; Material or Formal, &c.

CHAP. III.

Of the Nature of Power according to the Author.

1. *The Analogal Concept of Power as it is common to all its Analogata.*
2. *Whether there be Real Powers.*
3. *Certain Conclusions touching Powers.*
4. *That all Substances act immediately through themselves.*
5. *That a Peripatetick Power is a Non Ens Physicum.*
6. *That all Powers are really Identificated with their Subject.*
7. *That Powers are distinguished modally from their Subject.*
8. *How Powers are taken in the Abstract.*
9. *The Manner of the Remission and Intension of Powers.*
10. *The Number of the Formal Acts caused by a Singular Substance.*
11. *The Number of the Formal Acts caused by an Organical Substance.*
12. *The Solutions of several Doubts touching Powers.*
13. *That all Creatures have an absolute power secundum quid of acting.*
14. *In what sense Hippocrates and Galen apprehended powers.*

I. **T**O make a safe Inroad into this large Channel of Acceptions of Power, without being misled through its Ambiguities, it is adviseable to pitch upon a single Mark, which we shall do, in stating a single Concept of Power, common to all these. Power, as it is opposite to an Act, is whereby a being can be that either in its Essence, or Accidents, which it is not. This is the first Imposition, and immediate signification of Power, from which all the others are deduced, and are so called, so far as they have a resemblance to this single and immediate Concept of Power. A Being is pronounced to be in power, in that it can be that, which it is not: so active power is conceived to be a Power, because it can act that, which it doth not act, &c.

I said Essence, whereby I denote a substantial power; by Accidents, I intend a power befalling either to Quantity, Quality, Relation,

&c.

Ec. For in all these there may a Like power be discovered.

II. The first Doubt, which we must sound into, is, whether there is really or *ab extra*, and *a parte rei*, such a power as was before-mentioned. This is a Scruple, which possibly at first sight may seem ridiculous, especially to them, who take it for a piece of Learning, to receive with an undoubted assent, whatever is proposed by their Master. This supposed piece of Learning to me rather seemeth a piece of Ignorance: for never to doubt, is never to know: knowing is but a discerning truth from falsehood, and how can this be performed without doubting? Doubting exposeth truth and falsehood equally to our view. Since then it is so, let no doubt seem ridiculous, for fear we become ridiculous through not doubting. But to the matter in hand: we must repeat some of our Principles. 1. That that is only real, which moveth the understanding from without. 2. That nothing moveth the understanding from without, but what is either an Essence, or Mode of an Essence. If then a power, whether of an Essence or Accident, moveth the understanding from without, it is to be accounted real, if otherwise, it is to be thought a *non ens reale*. This premised, I conclude,

1. A Power is not a Real Being, because a power doth not move the understanding from without. I confirm the Argument. Imagine your self to be alone, it is possible that a Ghost may appear unto you in your Solitude. This Possibility is the power of the Ghost its Existence, or appearance to you. Now I demand from you, whether the power of a Ghost's Existence moveth your understanding before it doth actually exist? You will Answer me, Yes; for you know, that a Ghost can exist before it doth exist. To the contrary, you cannot imagine or know, that a particular Ghost can exist, before you have seen its shape, figures, modes, or accidents; but after it hath once appeared, then you may imagine or know, that a Ghost can exist in the same form and shape, as it did heretofore; and that but dubiously neither. Now what followeth hence? First, That a power doth consecrate a real being; for before you had seen that particular Ghost, you could not imagine or know that it could exist. This makes against the received Opinions of Philosophers, who say, that a Power doth precede all Acts. Here you may reply, that although you did not know the power of a being, before you did perceive its actual existence through your sense, yet this doth not infer, but that, when you do apprehend a beings actuation, you can think, that that

being, which you perceive to be actuated, had a power of being actuated, or how could it otherwise be actuated? So that your knowing or not knowing doth not cut off the real power, which doth precede its Act: and so you deny my supposition; to wit, that a being is real through its cognoscibility from without. To rectify your Judgements in this Particular, you are to observe, that it is not your particular knowing or not knowing of a thing, makes it real, but it is the cognoscibility from without makes a thing real, that is, its being in a capacity of moving mans understanding in general.

That body which is existent without the world, is it a real body or not? Probably you say it is: I ask you then what kind of body it is? You tell me it is an imaginary body, or that you do not know what body it is. If then it is an imaginary body; *ergo* it is no real body. Again, it is not an imaginary body, for you say it is an unknown body, How can you then imagine it? But supposing you imagine *Aristotle* to be existent without the last Heaven; *Aristotle* although existing there really, is but an *Ens Rationis*, or imaginary being as to you, because he is not cognoscible to you from without, but only from within. 2. He is cognoscible to be like to an actual real being; *ergo* he is no more then an *Ens Rationis*.

In the same manner, why should an *Ens in potentia* be accounted to be more real then *Aristotle* actually and really existing without the world? Wherefore a being in power is no more then an *Ens Rationis*, and in no wise real.

If a being in power were real, real beings would be infinite; because beings in power are indeterminated, and consequently must be infinite.

Lastly, I would willingly know wherein a being in power is distinguished from a *Non Ens*, or nothing? A being in power hath no Essence, neither is it definible, unless considered as an actual real and cognoscible being. A poor man is a rich man in *Potentia*, that is, he may be rich, but to may be rich, doth include a *Non Ens*, to wit, Poverty or no Riches. Besides, all beings act, but a being in *potentia* doth not act.

Power, denoting an actual Vertue and Principle of acting, is proper and adhering to all beings. A Power in this sense is Synonymous to actual Strength & Force, or is an actual disposition, through which a being doth operate, and produce effects. It is the same with the first Acception of *Zabarel*. In this sense are the Forms of the Elements

ments said to be Powers, which without doubt are actual. Nutritive and vital Powers are actual Vertues of nourishing and cherishing life. Obediential powers are actual dispositions, whereby beings are capable of receiving new forms from God, above or beyond their natural forms. That all Natural Powers are and must be actual, this ordinary Saying doth plainly infer; *ὅσα φύσιν γίνεται ἢ τέχνη ἐκ ἐνεργείας ὄντος γίνεται*. All things, that are made by Nature or Art, must be made from that which is Actual, that is, in *Actu*.

Against this may be Objected, That the power of seeing remaineth in a man, who is asleep, although he doth not actually see. I Answer, That that power is as much actual from within as it was before, but its Acts depending upon Objective Motions from without, are secluded by the interrent of the Eye-lids, or retraction and incrustation of the Optick Act: In the same manner a Candle actually burning in a dark Lanthorn, is not abolisht in its enlightning power, by the being shut in, upon which a darkness ensueth; for the Candle burneth actually still. The Stomach is not deprived of its actual concocting power in not seeming to concoct in the defect of Victuals, for the same Principle is stirring still in the Stomach, although there is no external Object to work upon. Wherefore Scaliger, *Exerc. 325. d. 4.* saith well, *Non enim tollitur potentia per Objecti ablationem, quia fluit ab internis Principiis essentialibus*. For a Power is not removed by the removing of the Object, because it flowes from internal essential Principles.

To assert, that a Power although Actual, is the Cause of an Act, and not the Essence wherein this Power is inherent, may justly be disputed by any Natural Philosopher, who collects his Knowledge of mixt bodies by means of his Senses, and apprehends its Affections and Properties together with the body it self, and not as if they were really distinct from it: Although in *Metaphysics* a *distinctio Rationis*, or a distinction of the mind is allowable, by which the Notions of Partial beings are totally abstracted from one another, and from their Essence: but in *Physicks* it is so absurd and perillous, that the assent thereunto hath misled many Physitians into a Labyrinth of Errors, which have proved very fatal and ominous to their unhappy Patients. In an ardent Feaver, where a great Heat and Inflammation broiles the tormented body of the Decumbent, a *Periparetick Esculapius* argues thus with himself: this is not the fire kindled within the Nutritive or Vital Vessels, but its power, quality, and

and heat inherent in that fire: whence he is perswaded to prescribe a whole Kinderken of *Ptyſan* and *Juleps*, to ſubdue this heat, imagining all this while, that the heat and fire are two really diſtinct things, omitting in the mean time ſuch helps, which might remove the burning or flaming Eſſence, by ſubſtracting the entire body of fire; which done, the heat is alſo removed with it; which may be performed by Evacuations, as Phlebotomy and Purges.

From this ſame Tenent ſpreads another, no leſs erroneous, concerning Humours: *Humores peccant vel Subſtantia, Quamitate, vel Qualitate*. Humors (ſay they) become vicious either in their Subſtance, Quantity or Quality. Humors become vicious in their Subſtance, when they variate (*tota ſubſtantia*) in or through their whole ſubſtance from themſelves: as, in the Plague, where the blood is changed throughout its whole ſubſtance, and become venomous, which is, when it doth in a ſmall quantity and ſhort time extinguiſh our vital Flame. Now, whether to extinguiſh our natural heat, doth not proceed from a power inherent in that venomous Blood, let them confeſs: How then according to their own Maxims can Blood be vicious in its ſubſtance, no ſubſtance acting immediately through it ſelf; for blood (*sanguis dicitur vitioſus, quia labem partibus injur*) is ſaid to be vicious, when it acts by injuring the parts. It remains then, that humors according to their own Principles, cannot be vicious in their ſubſtances, but powers or qualities.

2. Humors are pronounced to be peccant, when they do through their abundance wrong the Parts in their Functions. This is contradictory to their own received Doctrine: For whereas Quantity being an Affection and Paſſion of Matter, can be in no wiſe active, becauſe nothing (as they ſay) is contrary to it. How then can it act, ſince all Action is affirmed to tend to its contrary, according to this Maxim: *Nihil agit in Simile*. Nothing can act upon its Like.

3. It remains, that Humors muſt only be peccant in their quality. Not ſo neither; for then we ſhould only have need of alterative Medicines, and Evacuations would ſeem to be in vain. What numerous Abſurdities do ſcatter from this Spring of Falſhood? A part of *Democritus*, and *Ana* of *Heracitus* his Philoſophy, and of *Socrates* his Dictates *ad pondus omnium*, would make a better *Miſce* for a *Recipe* to introduce us unto a ſound Doctrine of Phyſick. From all which, I Argue, That Powers are neither really or formally

formally distinct from their Subject; and to avoid these forementioned Absurdities, I state that,

1. All Substances act through themselves, so far as they have a power of Acting.

2. All Powers are really Identified with their Subject.

3. Powers may be distinguished from their Subject modally, and through operation of the mind.

4. Powers are intended and remitted through the access and detraction of Degrees of the same kind: and are facilitated or retarded through Habits, or the defect of them.

The first Proposal contains three Assertions: 1. That all substantial Essences do (as they term them) act, which is evidenced through this Axiom, *All which is, is for to operate.* 2. That all Substances, (or according to my *Metaph.* Essences) act immediately through themselves. 3. That Substances act through themselves, so far as they have a power of acting.

IV. That all Substances act immediately through themselves, popular Speeches do testify: as, Fire burnes, a Horse runs, &c. Certainly these Actions are predicated of the Substance or Essence of Fire, or of a Horse; not of their powers, as if they were really distinct from them; for then they should say, the fires power burnes, a horses faculty runs. These Predications would be absurd. How can a Power (according to the vulgar *Peripaterick* Acception) be a power, and yet be said to act (it would be a Contradiction) since that a Power, whilst it doth act, is no more a Power, but is changed into an Act; hence they say, that a Power and an Act are privative Opposites, so that the one cannot be Categorically predicated of the other. Here may be replied, that a Substance acts through its power; wherefore it is not the power that acts, but the Substance. To this I Answer, that it may be granted, that a Substance acts through its power, but then it is not to be understood, so as if the Substance acted through another thing, or being, which is superadded to its Essence, as they do vulgarly conceive; but that a Substance acts through a Power, as one of its Parts (for as I proved, a Power is a Mode of a Substance, or one of its Parts) and therefore it is to be counted, as if it acted through it self immediately, because the Act of the Part is attributed to the whole.

So they say, a Horse runs, because he runs by means of some
of

of his Parts, namely, his Legs; nevertheless it is attributed to the whole thing. But take it how you will, that, which a Substance doth effect through one or more of its Parts, is effected immediately through it self, because its Part or Parts are it self. Wherefore if a Substance acted through its power as a being really distinct from it self, these Inconveniences would necessarily ensue.

1. That a being should exist without an Operation; for if a Substance did not act through it self, but only through its superadded power, then it self must exist without an Operation, which thwarts that Maxim, *Omne quod est, est propter Operationem*.

2. Substances would be censured less noble then their Accidents; for that which acteth, is more noble then that which acteth not.

3. An Accident then would be supposed to be the Efficient of a Substance, which contradicts another Maxim, *Qualis Causa, talis Effectus*. Such as the Cause is, such is its Effect.

4. It supposeth, that a Substance should be generated for an Accident, and not an Accident for a Substance; for since that all beings are for an Operation, it remaines, that its Operation can be nothing else, but to be a Subject to an Accident.

5. Accidents are said to be superadded to a Substance; *Ergo* according to their Philosophy, its power was also superadded. The antecedence and consequence are false. I prove the falsity of the Antecedence, which supposes, that a Substance is a Substance without Accidents; and therefore they say, that Accidents are superadded. I shew the contrary, granting their Supposition, that Accidents are superadded, there must necessarily be accidents, to wit, powers, allowed to Substances, before the superaddition of other Accidents is possible: For accidents cannot be superadded, unless a substance had a power of receiving those Accidents; but that power is an accident; *ergo* a substance is not imaginable without an accident. Hence it is, that *Aristotle* was forced to grant a coeval power to his *Materia prima*. Or lastly, thus; If a Substance acted through its power; *ergo* that Power must be either an Efficient, or instrumental Cause, or a *Causa sine qua non* of its acts. It is irrational to state it an Efficient, because then a Power produces a Nobler thing then it self, and an Effect different from it in *Specie*. It cannot be appropriated to an Instrumental, because it doth not differ

fer really and specifically from the principal Cause; besides, an Instrumental cause is moved from its principal, but a substance (as they say) doth not move. Suppose I grant it to be a *Causa sine qua non*, then it cannot be capable of producing an univocal Effect.

V. A *Peripatetick* power is a *Non Ens Physicum*; for it hath neither Matter or Form, and therefore cannot act physically. Hence it is shifted off to an *Ens Metaphysicum*, and so they say, it hath an *Actus Entitativus*: a plain Contradiction, What, can a *Potentia* be an *Actus*?

Aristotle teaches, that a Power doth alwaies precede its act; which I prove to be false. The Elements acted at the same moment, when they were created; Fire was actually light, Earth weighty, &c. Possibly you reply, that their Power was obediential to God; that is improper, for there could be no obediential, or any other Entitative Power without a Substance, or a Subject, wherein it should inhere.

A substance doth act so far as it hath a power of acting. By Power understand an actual virtue, or an internal and modal Principle of a Being or Essence, from which its acts do flow. This Principle is a derived and *congenited* disposition and limitation of a being to action, or is a being terminated and disposed to act such and such acts; for otherwise it would be indifferent to all acts. This limitation causes every being to act within its own Sphere, beyond which it cannot naturally excur to act any acts dissentaneous and impropionate to its Nature.

The forementioned disposition is the same, which in *Physicks* is nominated the Form and Activity of a being, and is nothing else, but a certain Temperament and proportionated mixture of the Elements in a Substance, the predominance of which doth dispose the body, constituted by their Congress, to determinated acts. But of this more at large in my *Physicks*.

VI. All Powers are really identificated with their Subject. A Power (as I shewed before) is that, whereby a Substance is disposed and determined to certain acts, and is nothing but the Form exalted to a certain degree. I shall make it plain by this Example of Wine or Brandy, either having a power of heating the body, as the Sectarists of *Ceres* and *Bacchus* witness, by drinking small Beer
O after

after a Debauch. That, which effects their heat, is the fiery parts predominating over the others, which predominance is the power disposed to that certain act. Is then fire predominating through its Access of Parts over the other constituting Elements really distinct from it self, because it is greater?

2. The power of moving a Leg or Arm is inherent in the Spirits disposed and determined to motion: Are these Spirits, when they do not move (for then they are counted a power of motion) really distinct from themselves, when they do move?

You may object: If Substances act through themselves, then alterative Medicines are exhibited in vain. A Mistake; For although I assert, that a Substance acts through it self, I do not deny, but that it alters, moves locally, or produceth all other acts immediately through it self.

VII. Powers are distinguished from their Subject modally and by operation of the Mind: A power may be taken in a double sense, either in the concrete or abstract.

1. If in the concrete, then it is no longer to be called a Power of a being, but a powerful being; it proving impossible to apprehend the one without the other, unless with intention to make a *Chimera* of it; for if you consider them apart, to wit, a *Being*, and *Powerful*, each by themselves, you must needs imagine an Accident denoting extrinsically, and from its first Imposition, an actual qualification of its Subject, not to denote an actual qualification, and consequently that a concrete accident is not concrete, *Powerful* is not powerful, and that a being is not it self.

2. In perceiving *powerful* separated from its being, you do apprehend power in the Abstract (which I grant to be possible) but not *powerful* in the concrete, which is repugnant; so that in considering *Powerful* in the Abstract you do absurdly confound it with Power in the Abstract.

VIII. *Power* conceived in the Abstract is taken for an universal Entity, abstracted by the Operation of the Mind from its Singulars, and in this acception it is in no manner of a *Physical*, but of a pure *Metaphysical* Consideration.

Metaphysical here I understand in the same Meaning, as it was intended in by *Aristotle*.

The same Philosopher defines Heat, Cold, Moisture, and Dryness:

That is, a
parte actus.

ness, by first qualities, not first Powers, because (according to his doctrine) they were actually inherent in the Elements at the instant of their Production; for power with him, presupposeth a *non existence* of the act thence flowing.

Wherefore it is apparent, that powers in the concrete are not distinguished from their Substance either really, formally *, or by any other Operation of the mind: but if by any at all, it is *ratione rationante, quæ absq; ullo fu fundamento*.

Powers in the abstract are distinguished from powers in the Concrete, in that they offer a common Mode and manner of qualifying, and accidentally specifying their Subject in the Concrete, to the Understanding, which occasioneth a Modal Distinction.

Philosophers not daring to desert the Principles of *Arist.* and yet finding, that Natural Substances act through themselves, and not through powers really distinct from them, are constrained to assert, that a Substance acteth and is either through or in *actu signato*, (which had they rendred it otherwise, to wit, that a Substance is and acts through a power, it would have been a Contradiction; for to act, and to be in *actu signato*, are opposite to being in *potentia*, and to act through a *potentia*) or in *actu exercito*.

IX. Powers are remitted and intended by subduction and addition of parts of the same nature, as it is evident in *Canary wine*, which is hotter then *Rhenish*, because it containes more dense and united fiery Spirits. One fire is hotter then another, because its similar parts are augmented by Access of Parts of the same Nature.

That Powers are facilitated and slowed, through Habits and Defects of them, is demonstrated elsewhere.

X. One similar Substance acts but one Formal Act (*per se*) through it self; and (*per accidens*) by accident, that is, through meanes of extrinsick Causes, many. The first part of this Theorem is proved by this Maxim. *Una numero efficiens producit unum tantum numero effectum*. One and the same Efficient can produce but one and the same Effect at one and the same time, and in one and the same manner. But a similar substance is but one Efficient; Ergo it can produce but one and the same Effect, &c. The Major is undeniable. I confirm the Assumption. A substance is effective through

* That is, by a formal reality, or such, as any other operation of the mind might adjudge to be formally real, or to respond from without to that distinct formality, which it conceiveth from within.

through its form, which being but one, must also determinate its Efficiency to one.

2. Fire is a substance : but fire hath but one power (*per se*) *Ergo*. I prove the *Minor*. That whereby the fire doth act, is its penetrable lightness ; but that is single in fire ; *Ergo*.

You may Object, That its heating, burning, and locomotive powers are more then one. To this I Answer, That the similar parts of fire exercises but one power naturally and in its natural place, but if extrinsically (that is, by an Efficient from without) united and condensed, it becomes of a burning Nature. Pray take the paines to peruse my Positions of fire in my Natural Phil. They are satisfactory to all Objections. As for its locomotive Faculty, it is the same with its rare lightness.

A Second Objection may be ; *Mercury* is a similar substance : but *Mercury* hath several powers of heating, cooling, fluxing, killing the Worms, &c. 'Tis true, the Effects are various, nevertheless the power, from whence they descend, is but one, which unity seems to be multiplied materially, that is, through the variety of its Objects. *Mercury* cooles in lax and weak bodies, because through its thickness and density it expels the loose heat of the said lax bodies. It heats in hot, strong, close bodies, because it is retained in such bodies, and being retained, its parts are opened by the strong heat of the said bodies, whereby the fiery hot spirits break forth, and unite themselves with the heat of such bodies, and so it becomes hotter. In like manner Fluxing and its other Effects are wrought all through one power, their difference hapning from the difference of the Object.

Obj. 3. If every similar substance obtaines one power of acting, then in every dissimilar or mixt body there should be four powers, because it consisteth of four similar substances. I Answer, That the Elements, when mixed, limit their power within one temperament, and one formal power.

The latter part of this Theorem is, That a substance obtaineth many powers (*per accidens h.e. in statu violento, eâdem quidem a principio, formali, sed mixto quorum agente, nec non a causa efficienti ab extra impulsâ, plane quod rei natura contrariatur*) by accident, that is when a substance is seated in a violent state, and although acting from its formal Principle, yet it is against its first Nature, as being opposed

opposed by an External Efficient.

XI. An Organical and dissimilar substance exerciseth naturally as many formal powers, as it contains similar substances in it self, really different from one another; and but one formal power, so far as these similar substances tend to the constituting of one formal substance. All similar substances contained within the Sphere of an Organical substance tend naturally (*e natura quadam necessitate*) and from a certain necessity of Nature (for they could not exist separately, because then they would be imperfect) to its Constitution. A hand is an Organical substance: In a hand are comprehended,

1. A Locomotive power,

2. A sensitive power,

3. A Nutritive Faculty. These various powers depend from the variety of similar (*scilicet ad sensum*) parts, to wit, the first from Nerves; the second the Membranes; the third from the vital heat: notwithstanding all of them constitute but one formal locomotive, sensitive, and vegetative power.

Actus and *Potencia* in the Concrete are really identified; for *Potentia* denotes an actual virtue and power in a substance. This may be called *actus activus*, and so *Anima* is defined *Actus* by *Arist.* 2. It imports Action. 3. It sometime implies an Effect, otherwise called *Actus passivus*. It is an *Actus*, because it doth act through a power, which it had from its first act, a different Effect. It is *Passivus*, because it receives its power from that first *Actus*. Wherefore you must take notice, that it is not termed *Actus passivus secundum Idem ad Idem*, for that would imply a Contradiction.

XII. From this Discourse we may easily be resolved in these Doubts.

1. Whether it be not repugnant, that any Accidental or Substantial Power should be superadded to its Subject? *Aff.*

2. Whether the volitive power in the Concrete be really and formally identified with the Soul? *Aff.*

3. Whether the Soul acteth immediately through her self, and not through superadded powers? *Aff.*

4. Whether the augmentative power be really and formally distinct

distinct from the Nutritive power, and the Nutritive from the Generative Power? There is a modal distinction, or *a parte rei* a Material one, but none Real.

XIII. Besides all this, there is an *Absolute Power* conferred upon Gods Creatures in general, and upon man in particular. I do not mean Absolute *simpliciter*; for that were Repugnant, as I have proved in my *Theol.* but *secundum quid*. I will further explain it to you.

The Power, which all Creatures have of being and acting at that present Moment, wherein they enjoy their being, and do act, is absolute, because they cannot but enjoy that same being, and act at that Moment, wherein they have a Being, and do act, *Ergo* it is Absolute: but not *simpliciter*, for were it so, then they would obtain that absolute power of being from and out of their own Nature, which we know is dependent from Gods Power; and according to this sense none consisteth of an absolute power, but God alone, because his Nature is alone independent. It is then absolute *secundum quid*, because God hath ordained that, which is, to be, and that, which ever hath been, to have been, and that which shall be, to come to pass. In short, Absolute *secundum quid*, I take for that, which is unchangeable, as all beings and their Actions are in that sense, as I have proposed. They are unchangeable, because Gods Ordination in Creating, Giving, Forbearing, and in all other Particulars, is unchangeable.

This Distinction is of that use, that many Points in Divinity cannot be resolved, but by its being applied to them. I shall content my self with the having named it, since I have Treated of it at large in another Part of my Philosophy.

XIV. The Absolute (*secundum quid*) powers, which God hath conferred upon his Creatures, are by Physicians otherwise termed Faculties; (*Facultates*) which are derived from (*a faciendo*) doing, that is, they are actual dispositions, whereby Effects are done. Hence Galen, *Lib. 1. de Natur. Facult. Par. 3. Prima enim actionis ipsius potentia causa est*. The first cause of an Action (saith he) is the power. And in another place of the same Book, he renders himself thus: *Facultatum quatuor naturalium essentia in partium singularum nutriendarum temperie est*: that is, The Essence of the four Natural Faculties consisteth in the temperament of the parts, that are to be nourished

rished: which is nothing different, then if he had said, the Faculties, (*Facultates sunt temperamenta facientia*) are temperaments actually doing effects. Now it is evident, that *Galen* held the Temperament of bodies to be their Forms, which if so, then questionless, his Opinion tended to assert, that Powers and their Subjects were really identified, and that all powers were actual. Moreover we shall find throughout all his Tomes, that his sense touching powers and Faculties doth *e Diametro* agree with what I have set down in this present Treatise. As for *Hippocrates*, I cannot read a word throughout all his works, but what tends against *Aristotle* in every Particular, forasmuch as it relates to our Subject.

In the Conclusion, I must remember you to observe, that many Terms, as, *Formal*, *Substance*, *Accident*, and divers others, I have sometimes made use of in the same sense, as I have proposed them in the Foregoing Chapters, other times I have intended them in the same Acception which Philolophers vulgarly receive them in; But herein the Sense of the Matter will easily direct you.

FINIS.

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RELIGIO PHILOSOPHI,
OR
Natural Theology.

The FIRST PART.

The fourth Book.

By Gedeon Harvey^r Doctor of Physick
and Philosophy.



L O N D O N,

Printed by A. M. for Samuel Thomson at the Sign of the
Bishops-head in S^t Paul's Church-yard. 1663.

RELIGIO PHILosophica

OR

Natural Theology

IN TWO VOLUMES

BY

JOHN H. WATSON, M.A.
OF THE UNIVERSITY OF CAMBRIDGE

LONDON

Printed by A. M. for Samuel Street, at the
corner of the Strand, 1840.



TO HIS
Most Honoured Mother
ELIZABETH HARVEY.

Dear Mother,



Among those serious Admonitions, which from your singular Affection and Care, you have so oft repeated to me, This I remember hath been one of the most earnest of them, that above all I should mind things of Eternity, such as alone can make me eternally Happy. Herein I cannot but acknowledge your greatest Love, tending to invest me with the greatest Happinesse, returning you all thanks, that

The Epistle Dedicatory.

So great a Benefit is worthy of. Moreover to shew my entire Obedience to so important a Command, I have here drawn up a few Heads touching the Greatest Happiness, and the Means whereby to procure it, which I do with all humility present unto you, as a Debt due to your self, in regard I have extracted the principal Rules from the Rudiments, which your constant Practice and wholesome Precepts had in my younger years insus'd in me. The cause and object, which alone can afford us this infinite Happiness, is the Summum Bonum, whereunto we are to direct all our aim; which that we may with successe attain unto, are the continual Prayers of

Your most affectionate
and obedient Sonne

Gedeon Harvey.



RELIGIO PHILOSOPHI,

OR

Natural Theology.


The FIRST PART.

The fourth Book.

CHAP. I.

Of the Nature of Natural Theology.

1. *What Theology is.*
2. *That Theosophy is a fitter name to signifie the same, which is here intended by Theology. That in knowing God we become Philosophers.*
3. *What a Habit is.*
4. *What it is to live happily. That there is a mean or middle way of living, which is neither living in happiness, or living in misery.*
5. *How Theology is divided.*
6. *What Natural Theology is. What Supernatural Theology is. The first Doubts of a natural man.*
7. *The Dignity of Theology.*

- I.  **HEOLOGY** is a habit of enjoying the greatest Good, and living in the greatest Happiness.

This practick Science might from the eminence and transcendence of its end and object, crave a more excellent name: for Theology signifieth only a discourse

course of God, and expresseth a Theoretick Science, and therefore is too strict to adequate the whole and full concept of what is generally intended by Theology. This name is fitter to be imposed upon the Doctrine of God, as he is theoretically discoursed of in *Pneumatology*: The parts of which Doctrine might be aptly denoted by *Theology*, *Angelology* and *Psychology*: whereas this noble Science is better expressed by *theosophia*, or wisdom of God, because wisdom comprehendeth an universal collection of all practick and theoretick Sciences; all which we know by knowing God, and we know them to be in, and from God: For, do we not know, that all natural Beings are in and from God? they are in God, because God comprehendeth and conserveth them in, and by his Power. Is not God the Pattern of our Actions? And do we not know that our actions are good or evil, from knowing them to have some likeness to his Actions, or to be altogether different from them? Do we not know our selves in knowing God? wherefore without knowing God we know Nothing. In knowing God to be the first Cause, and Creator of all natural Beings, we know *Natural Philosophy*, and become *Natural Philosophers*. In discerning good from evil in our actions, by comparing them to the most perfect actions of God, we attain to *Moral Philosophy*: In knowing him to be the Being of Beings, we reach to the knowledge of supernatural Philosophy or *Metaphysics*. This name doth in a large sense expresse Philosophy, and in a strict sense denotes Theology, as it is defined here above. The wise Apostle *James* seemeth to impose this very name, in that place of his Epistle *, *Wisdom that is from above, is, &c.* What is wisdom from above, but the wisdom of God?

* Chap. 3.

v. 17. and

Chap. 1.

v. 5.

II. The *Genus* of the Definition is a Habit, which is a rooted disposition, whereby we are inclined to operate with ease. It is not the enjoyment of one single happiness, which can make a man happy; for one act is transitory, and is not at all durable: but it must be a rooted happiness, the possession of which doth make us happy for ever. Since we are to live for ever, we must either be rooted in happiness, if we intend to be everlastingly happy, or else rooted in evil, whereby we continue in misery without end.

III. The happiness which we reap from this Philosophy is not an ordinary happiness, but it is a happiness in its highest degree and

and Perfection; or it is a durable contentment accompanied with the greatest joy that is possible to be enjoyed by us in this world. On the other side, the misery which attends the habit of evil, is no lesse tormenting, dismall and dolefull, than the other is joyfull.

IV. The *Differentia* of the Definition is, to possesse the greatest good, and to live in the greatest happinesse. All Practick Sciences do operate for an end, and therefore are to be defined by that End.

To live happily is to live in contentment and joy. There seems to be a *Medium* between living in joy, and living in misery, which is to live for a *Passe-time*: For there are many, who do all things for a *Passe-time*; they play at Cards, Dice and Bowls; they discourse and all for a *Passe-time*: Some take Tobacco, and drink themselves drunk for to passe away the time. Certainly these can neither say, that they are affected with joy or misery, but seem to be in a neutral state. Of these doth *Sallust* justly give his opinion: *Multi mortales dediti ventri, atque somno, indocti, incultique vitam, sicut peregrinantes transiere. Quibus profecto, contra naturam, corpus voluptati, anima oneri fuit. Eorum ego vitam mortemque juxta estumo: quoniam de utraque siletur.* There are many men, who being given to their gut, and to sleep, continuing unlearned and rude, have passed away their dayes like unto Travellers. To whom indeed against nature their body was a pleasure, and their soul a burden. These mens life and death I judge alike; for there is no notice taken of either.

V. Theology is Natural or Supernatural.

VI. *Natural Theology* is a natural habit of possessing the greatest good, and living in the greatest happinesse, that a natural man may attain unto in this world, and in the world to come.

Supernatural Theology is a supernatural habit of possessing the greatest good, and living in the greatest happinesse, that a man may supernaturally attain unto in this material, and in the next spiritual world.

It is not my drift to treat of supernatural Theology in this volume; neither do I pretend more in that, than a Christian Disciple, and not as a Teacher, to which a special Call, and an extraordinary spiritual disposition must concur: but my chief design

and aim is rationally to demonstrate a Natural Theology; such, which a man through his natural gifts of reason and understanding, may reach unto, without an extraordinary concurrence of God with him.

The benefit which is hence expected, serveth to convince those desperate and carnal wretches from their affected Atheism; yet must be lesse affected with it, than to be rooted and confirmed in it; In which, if otherwise they are, Reasoning will not take any effect upon them. The first doubt or query, which a natural man doth, or may propose is, Whether it is possible for him to know through his reasoning, if his soul be immortal: For saith he, if my soul is mortal, it will prove in vain to make further search after happinesse, then is or can be enjoyed in this world. The second scruple which a man (or rather the Devil) doth foolishly move to himself, is, Whether (the soul now being demonstrated to him to be immortal) there is a God: For whence can he expect any happinesse after death, but from God? Thirdly, Whether it is possible to a Natural man by his own power, and Gods ordinary assistance or concurrence, to procure the possession of the twofold before-mentioned *Summum Bonum*. But, before I apply my self to the solving of these Doubts, I must explain what the greatest happinesse is, which I intend to perform briefly and clearly in the next Chapter.

I need not adde many words to the illustrating of the eminence and worth of this Divine Science, since the name it self doth speak it. The eloquence of Cicero doth thus set forth the dignity of wisdom in his 2. *Offic.* By the immortal Gods what is there more to be desired than wisdom? what is better to a man? what is more worthy of a mans knowledge? The same may be better applyed to the wisdom of God, that is, concerning God. God (saith *Austin*) is wisdom himself, through whom all things are made, and a true Philosopher is a lover of God, in that he is a lover of wisdom. If we are ignorant of God, we are no Philosophers, and through that ignorance we fall into great Errors. *Lactantius* in his third Book, doth expresse himself much to the same tenour, where speaking of Philosophers, he saith, It is true, they have sought for wisdom, but because they did not search after it, as they should have done, they fell further into such errors, that they were ignorant of common wisdom.

CHAP. II.

Of the end of Natural Theology.

1. *Wherein Moral Philosophy differeth from Natural Theology; and wherein it agreeth with it. That the Heathen Philosophers were no true Philosophers. Aristotle his dying words. Epicure his miserable Death, after so pleasant a Life.*
2. *A Description of the greatest Happiness. Queries touching the greatest Happiness.*
3. *Whether the greatest Happiness is the neerest and principal end of Theology.*
4. *How the greatest Happiness is otherwise called.*

ONE or other may object against our Definition of Natural Theology, that I do confound it with Moral Philosophy. I answer, Moral Philosophy is taken in a large sense for a habit of living in the greatest happiness here and hereafter, and then it is synonymous to Natural Theology. Or in a strict sense; for a habit of living in the greatest happiness only in this world: which may be tearmed an *Epicurean* Moral Philosophy, and is such whose object vanisheth with the expiration of the soul out of the body. This last is grounded upon a false maxime of its End; to wit, that the greatest happiness, which can be enjoyed in this world, is essentially different from that, which we may enjoy hereafter. It is essentially different; because, according to their folly, there is no happiness to be expected any where else, but where we are at present.

The falshood of this Theorem is evident: because that greatest happiness which we enjoy in this world, is like (but in an inferior degree) to that, which we expect in the other. Neither is any happiness to be parallel'd to the greatest, but which is a true Theologicall happiness: If so, then a Theologicall happiness must be our *Summum Bonum*. No wonder therefore if Philosophers being destitute of this Theologicall habit were false Philosophers. This is the reason, why *Aristotle*, and other supposed

Philosophers, never arrived to the possession of the greatest happiness; because they were ignorant of God. And is it not therefore unworthy of a Philosopher to be a slave to their Dictates? which affected slavery, hath proved an obvious cause of the greatest errors in Church and State. How full of Anguish, fear, jealousy, and uncertainties were their souls through their not knowing the true God? They could never enjoy any durable happiness, as long as their minds were perplexed with them doubts. In what perplexity did *Aristotle* die? even when his languishing soul pressed out these words: *In doubts have I lived, and in more anguish do I die; whither I shall go I know not; wherefore shon Being of Beings have mercy upon me.* What did the joys and pleasures of *Epicure* amount unto, when he was tormented with such miserable pains of the strangury, as chased his soul out of his body?

II. The greatest happiness is, which of all things makes a man most happy. Happiness is a concomitant of a joyfull thing, or an effect wrought by a joyfull object upon man, the reception of which makes him truly happy. Here we will first enquire, Whether the greatest happiness is the neereft End of Natural Theology. 2. How it is otherwise called. 3. What it is. 4. Which is the subject of this habit. 5. How it is to be procured.

In answer to the first: I say, that the greatest happiness is not the neereft and principal end of Theology. I prove it: That which doth not chiefly and immediately move a man in Theology, is not the neereft and principal end: but the greatest happiness doth not chiefly and immediately move a man in Theology: Therefore it is not the neereft and principal end of Theology.

2. It is the next end to the neereft, and an inseparable concomitant of the neereft end: I prove it, That which we do enjoy next after the possession of the habit of Natural Theology, and of the *Summum Bonum*, is the next end to the neereft: But we do chiefly enjoy the greatest happiness next after the possession of the habit of Theology, and of the *Summum Bonum*: Therefore it is the next end to the neereft. There is none, which ever did possesse the habit of Theology, but confirms the truth and assurance of the *Minor*.

4. The

4. The greatest happiness is sometime called *Summum Bonum*, or the greatest good from its causality; because it doth through its presence confer the greatest happiness upon that Subject, which it doth irradiate. Hence *Austin. de Civ. Dei, lib. 8. cap. 3. Finis autem boni appellatur; quo quisque cum pervenerit, beatus est.* That is called the end of good, which maketh every man happy, that doth attain to it. Note that the greatest happiness is only tropically named *Summum Bonum*, from a *Metonymia causa pro effectu.*

CHAP. III.

OF GOOD.

1. What Good is.
2. That Aristotle's Definition of Good is erroneous.
3. Diogenes his Definition of Good.
4. The Explanation of the Definition of Good. How the several kinds of Good differ from one another.
5. What Moral Good is: what moral evil is.
6. What Theologic Good and evil is.

Bonum, Good is that which doth make the subject, which doth possess it perfect. Or Good is that, which all Beings do incline unto, for to perfect themselves. The highest and greatest Good must then be that which makes a man most perfect and happy: or that which all men need to perfect themselves with the same perfection, which man had, when he was first created. I said, need, and not desire or incline into: because all men do not desire the *Summum Bonum*: for all men do not come to the knowledge of it: yet all men need it for to perfect themselves.

II. There are many definitions of Good spread among Philosophers: whereof some are false either in not adequating the whole definitum, or else in attributing falsities by it to the definitum or subject defined. Among these that of Aristotle is counted most

* Lib. I. cap.
I. Ethic.

most authentick *: Good is that, which all things do incline unto, or cover. This definition must either agree with Good, as it is proper to all Beings, and Transcendent: or as it is restricted to rationals and animals, in which only there is an appetite and coveting: or as it is most limited to rationals only. If we take it according to the first acception, the definition is not formal, but only accidental: for it is accidental to beings as they are Good, to be covered or be desired from another being. Neither doth it hold true in the last acception: because we desire many things, which are evil, and hurtfull to us. To this may be answered, that a being, so far as it is desired, is good, although it prove accidentally hurtfull. This answer is not satisfactory: for we do oftentimes desire things knowing them to be evil; and therefore we do desire them as evil: for the will doth covet things as they are understood: if then the understanding doth understand them to be evil, the will must consequently will them as evil. Possibly some do reply, that the understanding doth conceive them very things, which a man afterwards doth cover, ~~for~~ To be good, otherwise he could not desire them: For, ~~if~~ Did he desire them as evil, then he would desire his own destruction, and be inferiour to all other creatures, which are onely bent to that, which doth perfect their nature: or you may return your answer thus; that good is either apparent, or real and truly good; and that the understanding doth understand all beings to be good apparently or really: or otherwise you may distinguish good, in good, which is honest, or profitable and usefull, or pleasant, and state that the understanding doth conceive all things either as they are honest, useful, or pleasant. This doth not remove all objections: as to the first; The will of man is not restrained to a certain object as Naturals are, but is also extended to contrary objects; to wit, to good and evil. Neither is it singly limited to contradictories, as to will evil, and to leave it, because to desist from an action is no action, and for that reason we cannot properly say, that the actions of the will are free (*quoad contradictoria tantum*) only in willing evil and ceasing from it. Secondly, Should God punish us for doing evil, when we cannot act any thing but evil, it would appear somewhat severe: for punishment is to punish a delict, and sinne, in doing that, which we should not do, and not doing that which we should do: if

we

we should do a thing, it supposeth we can do it, otherwise it would seem absurd. No dispute, but we do and can will evil as evil, and consequently the *Definition* is erroneous.

2. The second Solution doth not clear the point, in supposing that the evil, which we do will, we will it not as evil, but as apparent good. This is futile: for what is apparent good, but a real evil? A thing must either be formally evil, or formally good; betwixt these there can be no *Medium*.

The third is grounded upon a false distinction: because good, as it is good, doth not imply formally honesty, usefulness, or pleasure: neither is it universally coveted by all bodies, as it is affected with any of these accidents, but as it doth perfect them. So that a pleasant good is frequently not coveted, as a pleasant good, but as a pleasant evil, and we do know that same pleasant evil to be so, before we do will it. The same may be said concerning good, as it is usefull. Nevertheless may good be also coveted sometime, as it is pleasant, or usefull, or honest, but these are only accidental to good.

III. *Diogenes* the Stoick defines Good to be that, which is perfect in its own nature. Herein he confounds perfection with good, which are formally different one from the other, as I have shewed in my *Metaphysicks*. Besides Good is here considered as it is relative, or related to another Being, although in *Metaphysicks* it is treated of, as absolute to a Being.

IV. Good is, whose end is to perfect that, which doth bend to it, all Beings bend to each other, because they perfect one another. By perfection understand the further constitution and conservation of a Being; for all Beings are further constituted and conserved by other Beings. This end may prove frustraneous to many bodies, but that is not through the default of Good, but of that Body, to which it proveth frustraneous, although bent to it. Note, that it doth not follow, that all, which a Being is bent unto, is good for it, although it followeth, that all which doth perfect a Being, is good. All Beings are essentially bent to what is good, but accidentally they bend also to what is evil. A depravate will is accidental to man, and therefore man doth accidentally covet evil. This evil although it is coveted accidentally by man, yet by his will it is desired formally, and *per se*.

IV. There are several degrees of good, which do not differ essentially from one another, but have a resemblance and proportion one to the other; so that one can become the other, or change into the nature of the other. According to this, good is gradually distinguished into Moral Good, and Theologic Good.

V. Moral Good is, whose end is to perfectionate man, as he is in a natural state.

Moral Evil is, whose end is to corrupt man, as he is in a natural state.

VI. Theologic Good is, which doth perfectionate a man in a supernatural state.

Theologic Evil is, which doth corrupt a man as he is in a preternatural state.

Of these I purpose to treat of distinctly in the next ensuing Chapter.

CHAP. IV.

Of Moral Good, and Moral Evil.

1. *An Explanation of the Definition of Moral Good. What is understood by a Natural State. The ambiguity of the word Natural.*
2. *What Moral Good it is, which doth respect the Body. What Moral Good it is, which respecteth the Soul.*
3. *An Explanation of the Definition of Moral Evil. That God doth not properly bend to his creatures.*
4. *The Distinction between these two predicates, to be Good, and to do Good.*
5. *How Moral Good turns to Moral Evil.*
6. *That Man, as he is in a natural state, is in a middle state, between supernatural and preternatural.*

First, It is requisite to unfold the ambiguities of the terms contained in the Definition of Moral Good. What it is to perfectionate I have already declared: It remains to amplify, how man

man is understood to be in a Natural State. A Natural Being is frequently taken for a Being, which is in the same state wherein it was created or produced. A man then is said to be Natural, when he is in the same state wherein he was created. There is a two-fold Creation: 1. There is an immediate Creation of man, whom God did create immediately through himself, no other mediate effect being interposed. 2. A mediate Creation of man is, whereby he is, mediately through his Parents, created by God. Man being created by an immediate creation, as long as he continued in that nature and state, wherein he was created, was natural: but having corrupted that state through his appetite after Evil, he became counter-natural, in respect to his former state.

A Natural Being is also understood for that, which continueth in the same state, wherein it is, as it is produced by a mediate creation; and in this sense we are to apprehend it here. Here may be offered an Objection, That a Being cannot be said to be created by a mediate Creation, and yet be counter-natural. Pray observe me well here in this place: I say, that man, who is created by a mediate Creation, is counter-natural; but I do not say that God, who created him, did create him counter-natural: for he created him Natural. Of this more at large elsewhere. And to return to my purpose: Man, as he is natural according to the latter acception, doth perfectionate himself by that Moral Good, which he doth bend unto, and that same moral Good doth conserve and further constitute a man in that nature, wherein he was created by a mediate Creation. Man is sometimes taken disjunctly, for his body and soul: or else joynedly and integrally, as he doth consist of both united.

II. According to the first distinction there is moral Good, which chiefly concerns the Body of man: as meat, drink and cloaths. There is also a moral Good chiefly respecting the soul: as speculative and practick objects are morally good to the soul. You may demand, how practick and speculative objects do perfectionate the soul? I answer, That they by their objectivenesse do conserve the souls action in its goodnesse; for had the soul no moral good object to act upon, it would be without a moral good action, which is repugnant to that Maxim, *Omne quod est, est propter operationem*. All which is, is for to operate. In like manner do food and cloaths conserve the Body of man in its natural state.

III. Moral Evil doth corrupt a man, as he is in a Natural state, and makes him counter-natural, that is, worse than he is in a Natural state. I am required here to illustrate two obscurities: 1. How Moral Good can be said to be good. 2. How Moral Good turneth to Moral Evil. In reference to the first, we are to call to mind the definition of Good, which is, whose end is to perfect that, which doth bend to it. If then Moral Good obtains a virtue to perfect that, which bendeth to it, it argueth that it is good. You may reject my definition of Good: because according to it, it follows, that God is conserved by his creatures, since he is known to bend to them. In no wise, for God doth not properly bend to his creatures: because he is every where with them: But Gods creatures may be properly said to bend to him: because bending doth follow a need; and want of conservation, which need being in all his creatures, but not in God, they do bend to their Creator.

IV. To avoid falsities and errors in this nice point, it will not be amisse for you, to observe a distinction between these two predicates: to be good, and to do good. These are oftentimes confounded by many Divines, and so thereby they fall into gross errors. To be good denotes a formality of good, as it doth concur to the further constitution of a Being by its modality. To do good is an action whereby effects are produced from a good Being: Now these actions are called good, because they proceed from a good Being; and not, because they are essentially good, and constitute an essential difference from its Being. So that good actions are signs of goodnesse in a Being, and not the goodnesse it self. To do good therefore is onely to act from a good principle, and to give signs of the goodnesse of a Being. This distinction proveth very usefull and expedient to the discussing of the doubts touching Free-will. Annex to this observation, that in a large sense Moral good is taken for good, as it is defined above, and extendeth to other creatures than unto man onely, for this reason: because Moral good, as it is synonymous to a mean, and inferiour good, is become so to all, in being changed from the highest good, through the defecting of man from his highest good, to a mean or moral good. In a strict sense, it is taken for the goodnesse of man in his actions, or manners onely.

V. How

V. How doth Moral Good turn to Moral Evil? This Question may be variously understood: First, as good importeth a natural good in the second acception, and as it denotes a goodnesse in the Being, and not in its action: in this sense moral good cannot change into moral evil, because nothing doth corrupt itself, I mean its own Being and Essence. If moral good is taken for a moral good action, then it is coincident with a true action, which is such as God doth require from us, and is conformable to that action, in which God did create us: I say in which: for all beings are created to be in action; and not through which, because that specifies Creation. According to this acception then are morally good actions said to be such, as are true or conformable to their Pattern. If these actions are false and disformable from their Pattern, then they become evil. These actions do proceed from a free cause, and not necessary; for then man could never have committed any evil. The freedome of this causality consisteth in an indifferency to Good and Evil.

The state of man, when he is at present is neutral, that is, natural, which is a state neither supernatural or preternatural. I prove it; A supernatural state is, wherein man is most good, or consisteth of good in the highest degree. A Preternatural state is, wherein a man is at the worst, or consisteth of evil in the lowest degree: But a man in a natural state is neither most good, nor worst in evil. Therefore he must needs be in a neutral state.

VI. Man, as he is in a natural state, is in a middle state, between super-natural, and preter-natural. I prove, it is a property of a Middle or *Medium* to participate of both extremes. But man in a natural state participates of both the others. *Ergo*, He is in a middle state: I confirm the *Minor*. The good which man doth act is not the best good, neither is the evil, which man acteth the worst evil: for the Devils act worse. *Ergo*, It participateth somewhat of good in the highest degree, and of evil in the worst. Or the actions, which a natural man performeth, are neither the worst or the best: Therefore it participates of each. Another property of a natural or middle state, is to have a disposition or capacity of becoming to be either of its extremes. This I prove also to be in man, as he is in this present state. Many natural men are glorified, and many are damped. *Ergo*, A natural

ral man hath a disposition to either.

Moral Evil doth corrupt a man, in that it partially destroyeth his perfection.

Moral Evil is either an Evil of the soul or body, or of both.

CHAP. V.

Of Theologick Good, and Theologick Evil.

1. *An Explanation of the Definition of Theologick Good.*
2. *An Explication of the Definition of Theologick Evil.*
3. *What honest, usefull and pleasant Good is.*
4. *What Natural, Sensible and Moral Good is.*

I. **T**heologick Good doth perfectionate a man in a supernat-
ural state only: For a natural man as long as he doth con-
tinue in a natural state, cannot be theologically good, or do a
good act, that is theologically good. A supernatural state is,
wherein a man is above his natural state, and is at his greatest per-
fection.

II. Theologick Evil is directly contrary to Theologick Good.
Neither is it possible that both these should be in one subject,
there being no greater contraries, than Theologick Good, and
Theologick Evil. They are most remote from one ano-
ther: so that there is an infinite proportion of distance
between them.

Theologick Evil doth make a man worst; he cannot be worse, than
when he is theologically evil; neither is there then any capacity
or disposition remaining in him, whereby he may be changed in-
to Good: So likewise a man, who is Theologically Good, hath
no disposition to Theologick Evil.

Theologick Good implieth a triple Good: 1. It imports
* Luc. 8. a Theological good cause, or which doth make a man perfect in
None is good but a supernatural state; and so God is the only Theologick Good *.
God alone 2. It is taken for a Being which is theologically Good, or for a
Being which is at its greatest perfection; and so may man in his
entire

entire state be termed Theologically Good. 3. It may be understood for an action, which is Theologically Good, that is true and conformable to its pattern, and of this Good is man also capable in a supernatural state.

The Theologic Good which is in God is called Good through it self, or *Bonum per se*. This *Bonum* is otherwise called *Summum Bonum obiectivum*, or *Beatitudo obiectiva*: But the joy which we receive from that objective happinesse, is called *Beatitudo formalis*. The Theologic Good, which was in all his creatures, is a Derivative Good, or *Bonum per participationem*.

The *Peripateticks* divide Good in that, which is honest, usefull and pleasant.

Honest Good (*Bonum honestum*) is, which is agreeable to Right Reason; and therefore they say, it is Desirable through it self.

2. Useful Good is that, which is desired for its usefulness and convenience. Pleasant Good is, which is coveted for its pleasure and delight, which it affordeth. These two are not to be desired for their own sake, but for their convenience and pleasure, which do accompany them. This Division is erroneous upon a double account. 1. Because Good doth not formally include in its formal concept any delight, usefulness or honesty, but onely a perfectionation. 2. The dividing members cannot be equally attributed to all the kinds of good, and therefore the distribution is illegitimate.

IV. Good, according to the subject, wherein it is inherent, or according the appetite, through which it is coveted, is either Natural, Sensible or Moral. Natural Good is, which is covered from a natural Being. The appetite, through which natural Beings do cover Good, is commonly called a natural Propensity or Inclination. Sensible Good is, which is coveted by living creatures. Their appetite is called a sensitive appetite. Moral Good is, which is coveted by man. His appetite is otherwise known by the word Will.

Before I conclude this Chapter, I must intreat you to remember and take notice of the several acceptions and distinct significations of *Natural*, *Supernatural*, *Counter-natural*, *Preter-natural*, of *Good*, *Moral Good*, and *Theologic Good*. For you are to interpret

pret their significations variously, otherwise you will much mistake my meaning.

CHAP. VI.

Of the greatest and highest Good,

1. *A further illustration of the greatest Good.*
2. *That the highest Good is the neereſt end of Natural Theology.*
3. *What the Summum Bonum is otherwiſe called. That the greatest Good is our laſt end.*
4. *The inexpressible Joy, which the ſoul obtains in poſſeſſing the greatest Good.*
5. *Two great benefits, which the ſoul receiveth from the Summum Bonum.*

I. **I**T was neceſſary for you firſt to know, what Good was in General, before you could conceive what the highest Good is. So then, having laid down the Doctrine of Good in ſhort, it now remains to open to you, what the greatest Good is.

The greatest Good is that, which doth make us moſt perfect; and that is God alone. I prove it; There is nothing can perfectionate us moſt, but God alone: Wherefore he is the onely *Summum Bonum*.

II. The highest Good is the neereſt end of Natural Theology. I prove it. That which we do immediately and neereſt incline unto and covet, is the neereſt end: But we do immediately and neereſt covet and incline unto the *Summum Bonum*: Wherefore the *Summum Bonum* is the neereſt end. I confirm the *Minor*. We do immediately covet that, which doth perfectionate us, becauſe it is out of neceſſity. The neceſſity appears in this; in that we muſt live to God; for without him we cannot live or exiſt, and conſequently we cannot be perfectionated without him. Now that which is moſt neceſſary, muſt precede that, which is leſſe neceſſary; for it is poſſible for us to live without happineſſe, and only to enjoy our being, if God had ſo pleaſed. And therefore
happineſſe

happineſſe is not abſolutely neceſſary, but is ſuperadded to this our appetite meerly from Gods bounty. We ought firſt to bend and incline to God; becauſe he is our *Summum Bonum*, and doth perfectionate us; and not only, becauſe he doth make us happy. In this bending to God; we anſwer to our end, and are true beings. The ſame is alſo witneſſed by Scripture, *Prov. 16.* God hath made all things for himſelf.

III. *Summum Bonum* is otherwiſe called our laſt End, becauſe it is that, in which all our good Actions ſeem to terminate: I prove that the greateſt Good and happineſs is our laſt End. All Trades and Professions tend to make proviſion for mans life. This proviſion, as meat and drink, &c. ſerveth to keep the Body in repair, that ſo it may continue a convenient manſion for the Soul, and ſerve her through its organs. The prime organs are the inward and outward Senſes, which are ſubſervient to the Soul, in advertiſing her of all things, which may be prejudicial to man; and in pleaſing her by conveying the objects of all external beings to her; and commending them to her Contemplation, which doth chiefly conſiſt in the diſcovery of the cauſes of all things. The Soul, being now brought and ſeated in the miſt of her ſpeculations, doth not come to any reſt or ſatisfaction there, but ſtill maketh way, and paſſeth through them, untill ſhe arrives to the laſt object, and its laſt end, which is the fartheſt ſhe can dyve. This laſt object is God, becauſe he is the laſt end of our contemplations; for beyond him we cannot conceive, or think any thing. It is alſo certain, that all beings have their end, and are terminated by it. This doth infer, that the actions of man muſt alſo have their end: The principal actions of man are them of the Soul; to wit, his underſtanding. The underſtanding is not terminated by any material ſubſtance: for it can think and underſtand beyond it: neither are created immaterial ſubſtances objects, beyond which the Soul of man cannot imagine: for it doth imagine, know, and underſtand God: but beyond God it can imagine nothing.

All Beings have their cauſes, theſe cauſes have other cauſes, theſe other cauſes at laſt muſt owe their being to one firſt Cauſe: otherwiſe cauſes would be infinite, which is repugnant. Wherefore we cannot think beyond the firſt Cauſe.

IV. The Soul having ſublimed her ſelf into a moſt ſublime

Dd

thought

thought of God, there she resteth, and admireth his great power in giving a Being to all sublunary and superlunary things. She admireth his wisdom and providence in preserving them all. She is astonisht at his infinite love towards mankind, in Breathing his Essence out of his own breast. The joy and acquiescence which the Soul findeth in the contemplation of this last End and first Cause, is so great, and unexpressible, that there is nothing in this vast World to resemble it unto, but to it self.

Thus I have demonstrated how all the Actions of man tend to one last End, and *Summum Bonum*.

V. From the Greatest Good, we receive two benefits: First, it makes us most perfect and most happy: Secondly, it terminates our faculties; for in all other Things we can find no rest, but in the *Summum Bonum* only. All other things can give us no rest, because they are ordained for a further end, and subject to changes and alterations every moment; but the *Summum Bonum* is the same for ever and ever.

As for the happiness which doth redound from the possession of the *Summum Bonum*, it is a Joy and contentment beyond expression. None is capable of conceiving what it is, except they who are the possessors of it. The joy is such, that if a man hapnerh to it, and is confirmed in it, he can never desert it: a moments want of it, would seem to be the greatest misery.

CHAP. VII.

Of the false *Summum Bonum*.

1. *The Summum Bonum of the Epicureans unfolded and rejected.*
2. *That Wealth is a greater torment than a Summum Bonum. The Riches of Seneca. That we ought to follow his example.*
3. *That to be taken up in merry discourses is not the greatest happiness.*
4. *That it is not the greatest happiness to be merry twice or thrice a week at a mans country house.*
5. *That honour is not the greatest good.*
6. *That swearing is no happiness.*

7. *The Author's ground why he was compelled to make use of so light a style in this Chapter.*
8. *That all these enumerated instances are highly to be imbraced as good, but not as the greatest Good. That meat and drink are to be taken with temperance.*
9. *That Riches are not absolutely to be rejected.*
10. *That mutual converse is commendable.*
11. *That a constant society is necessary to man.*
12. *That we ought to give honour to whom honour is due.*
13. *That we ought not to refuse an Oath tendered by the Magistrate.*

THe Error and mistake of the Epicureans, cannot but startle any one, who is but irradiated with the least glimpse of the *Summum Bonum*. They do foolishly conceit that the greatest good and happiness consisteth in Pleasures, that are taken by these two external senses; of tasting, and of the tact: which pleasures primarily are gluttony, and its companion. What are these pleasures but momentary? the enjoyment of them makes a man more restless, than he was before: A glutton's stomach is no sooner filled; but his pleasures are past and vanished: his next wish is; that his stomach were empty again, for to enjoy new pleasures. This vice is endemick to some people, whose custom it is, to take it for an affront, if their guests rise from the Table, before they have filled their crop twice or thrice, and discharged is as often by vomiting their lading up again, which perhaps, if it light into their neighbours lap, is only taken for an act of necessity, and an endeavour to make amends to the master of the feast: for the greatest thanks he expects, is to hear a man relate the next day, that he did not spare to make himself a Beast yesterday through his noble and liberal entertainment. A man who intends to follow the mode of these treatments, is not to call simply for (*trinken*) drink at Table; but (*zuzaffen*) for a draught, (rather for a traffe like hogs;) that is as much as he can well swallow down with an open throat, or no lesse than will swell him to that bigness, as forceth him to unbutton two or three buttons of his doublet, and so drink as long, untill all his buttons are dispatcht: and by that time they are got to their greatest happiness, which is to lie dead drunk one a top the other. Wherein, are these men

different from so many hogs, lying one upon the other? they grunt in that dead sleep like hogs. They befowl, kick and tumble over one another like hogs: were there hogs among them, they could not distinguish themselves from those hogs. And is this then a happiness to be a hog? they are worse than hogs, for hogs discern one another; but they are blind, dumb and deaf: These men are more fit to receive the Devil than happiness, like unto the herd of swine which the Devil enterd.

As for the other *Summum Bonum* of the *Epicureans*, it is so far from an acquiescence and Joy, that *Aristotle* makes a detestation of it. Look in his *Probl.* Διὰ τὸ οἱ νέοι ὅταν πλεονέκῃ ἀρ ποδιστάζην ἀρχεται αἷς ἀν' ὁμιλήσῃσι μετὰ τὴν πλεονέκῃ: μίσους; ἢ διὰ τὸ πλεονέκῃ γίνεσθαι τὴν μεταβολὴν; τῆς γὰρ συμβαίνεισης, ὅσῃ ἀνδρα μνησθέντι αἷς ἀπὸν ἢ ἐπὶ πλεονέκῃ φέρῃσι.

II. Nolesse are they mistaken, who make their wealth their god, oftentimes not regarding how they come to it, whether by craft or overreaching of others. These misers instead of embracing a perfect Joy, they precipitate themselves into a miserable and Tanteleon covetousnesse, being tormented with insatiable pangs after more money, thirsting with a fiery drought, not to be quencht by the pouring all the *West-India* mines upon them. If many in their tun-bellies, were but sensible of the torments and unquietnesse, which do accompany their *Summum Bonum*, they would soon desist from grappling after their tuns of gold. The experience of the great Moral Philosopher *Seneca*, might well perswade them to imitate his dictates of competency: for he, although his estate was computed to the value of threescore hundred thousand Pounds, as *Justus Lipsius* recordeth of him; yet being sensible of the great weight in keeping of it, and tormented with burning desires to increase it, did contemn it all, being fully perswaded, that contentment was of greater worth, than all his treasure.

III. In some Countreys the greatest accomplishment of a Gentleman is counted to be his breeding and good behaviour, which in *France* is called *bonne mine*, wherein the more a man can please his *Madame*, the braver Gentleman he is accounted: so that all their education, as their dancing, their study in pleasing discourses, tends only to delight their Ladies, and themselves: insomuch that in their confabulations with them, they imagine them-

themselves to be possess of an unparallel happinesse: which, their having a countenance marked with smiles and joy: their Eyes sparkling with lustre: their Bodies being altogether transformed into an air: the continual gesticulations of their Bodies, and trepidation of their Voices, do abundantly testifie. The plurality of the world doth unanimously agree herein, that it is a great happinesse, and no lesse contentment to passe away the time in mirth and pleasant discourses, wherein a man's mind seemeth to be much satisfied, wishing the night to be spent, that his wonted mirth might be disclosed again through the presence of the ensuing day. The whole troop of Poets seem to be sworn to bend their wits only to extoll the happinesse and joys with which this *Bonum* is endued, and to make it analoag to the *Summum Bonum*; for may they say, here are persons taken up with a contemplation, surprized by an admiration: not only so, but they receive thence great satisfaction, and joy, whence it appeareth, that there is some resemblance, and more than there is in any other *Bonum*: This is the ground, why Poets descant thus upon their gods, in feigning to be ravished by one anothers discourses, and to be stupified through amorous Joys: This they assigne upon them, as being the greatest happinesse, and therefore worthy of Gods. On the other side, this *Bonum* may be numbred among transitory felicities, and therefore is not the greatest: for a man here is, as it were, in a dream, wherein he phansieth multiplicity of Passages, and when he awakes, all is vanished. The like is observable in this case: we talk of sundry subjects successively, which serveth only to drive away the time, and therein it pleaseth the mind, there being nothing more tedious to it, than idlenesse. This is fickle, and alterable, satisfying the soul at one time, and not at another; for a while only, and not for always; we may admire one person for his discourse to day, to morrow we may admire our selves for admiring the same person yesterday. The discourse being once ended the happinesse vanisheth, and is the same with a dream: for in a dream we seem to be as joyfull in discoursing with any pleasant person, as we are, when we are awake; but the dream being discuffed, all vanisheth with it. Pray, what difference is there between a joy apprehended in a dream, and a joy perceived when one is awake? yea oftentimes the profusion of joy is greater in a dream than when we are awake. Well

may we thence proclaim, *that all is vanity.*

IV. No small number are they, who place their greatest happiness in being merry once or twice a week with their Wives at their Country-houses. All their toiling and moiling tends only to procure so much wealth, as to be thereby in a capacity of purchasing themselves a Country-house, where a man may leave his consort, and after a few moments absence return loaden with joy, as if newly arrived from a *Japan* voyage. This meeting after some hours parting doth so extreemly transport him, through the sudden spying of his female second-self among the green leaves and odoriferous flowers, that he imagineth himself to be no less than an Angel admitted into a *Mahomet's Paradise*. This may be a happiness if prudently managed; but to compare it to a *Summum Bonum*, is to make it appear a *Summum Malum*. Assuredly that, which a man at several times doth leave and return to: doth love and hate: doth trust and suspect: doth agree and disagree with: doth esteem and revile: doth please and displease him, is far distant from a *Summum Bonum*, which at all seasons and minutes is **Semper Idem*. That which depends upon a man's humour, being disposed to alteration, and variety every moment, cannot be the greatest happiness, which alone lasteth to all eternity.

* L. I. 7.

V. What shall I say of honour? A gift, which is at the disposal of every bumken, and sometimes a liberal bounty of the vilest persons: for it depends upon their pleasure, whether they will confer it upon a deserving person, or not. Honour is a thing, wherewith men are often clodded, and so come to loathe it. They have so much of it sometimes, that they do not regard it at any time. Men need not to make a *Summum Bonum* of an air, of a shaking of a hat, of a bow, of a curtzy, of a leg, of a gaze: all this is but a flash. And what are the fruits and effects of it? Possibly they may perceive a swelling of their mind, and a puffing up of their spirit, which may put them into a Bridegroom posture, wherein he doth more admire himself, than a Bridegroom doth his Bride.

VI. Many there are, who take a wonderfull delight in swearing; each third word must have a *S'mounds*, or *by God*, or a *God damme me* for its attendance, otherwise the language would seem to be imperfect, or at least to want its natural eloquence. This interjection of speech is so much practised, that some Masters

sters of Languages in *France* make it the third lesson to their scholars. A *Germane* newly arrived at *Paris*, and applying his mind to the study of that language, shewed me his third Lesson, which his master had recommended to him, to learn by heart. This piece of Doctrine did contain no lesse than thirty or five and thirty oaths; some of which he said were of the last years invention, which his Master had particularly marked. I asked the Gentleman, how he would come to know their proper places and insertions; he answered me, that that was the first Question, he asked his Master, who resolved him, that a little converse with the *French* would soon make him perfect in that business. *O Tempora, O Mores!* What is there more abominable! How is it possible for men so to mistake, and not know, that this is *Belzebubs* Rhetorick, the *Devils* mother Tongue, *Satan's* mirth. This is the only language wherein the *Devils* and men, *Wizards* and their spirits understand one another.

VII. I doubt not, but by this time you are better resolved, and fully perswaded, that none of these before-mentioned instances are a *Summum Bonum*. And before I put a period to the enumeration of the adulterin greatest Happiness, I must tell you my scope in having declared them by a prejudicial style, or rather a style, which may seem to partake of a lightness, being altogether unbecoming to my intended purpose. In reference to the first, I confesse, I have a prejudice against them, as they are falsely taken and supposed to be the greatest Happiness, and may beguile us of the true Happiness; and therefore I have detected and enquired into their height and highest degree of their good, delight or happiness; which to perform, I was compelled to make use of such kind of flashy and light expressions.

VIII. As they are good, and bear onely a representation of good, they are necessarily and highly to be imbraced: because they conduce to the enjoyment of the greatest Good, and are effects, tokens and signs of it. Meat and Drink are preservatives of man, and therefore conduce to the enjoyment of the greatest Good. They are created and ordained through the goodness of the greatest Good, which is an effect, token, and sign of the greatest Good. To imbrace these as Good is to imbrace them with temperance; whose potential parts are four: 1. Abstinence, which

which consisteth in a moderation of eating. 2. Sobriety, which consisteth in a moderation of drinking. The other two parts are Chastity and shamefastnesse, which do consist in moderating the affections of man and woman towards one another.

IX. Riches, as they are external good things, are not to be absolutely rejected, if moderated according to the Rules of liberality. They are the necessary means, through which all humane Policy is exercised.

X. Affability, mutual converse and society, conduce much to man's edification in knowledge. Hence doth *Aristotle* define Man, ὁ ἀνθρώπος ἐστὶ τὸ ζῶον πολιτικόν. Man is a Politick living creature. Politick is to be inclinable to a mutual conversation. Were it not, that man had the benefit of converse, he might require *Methusalem's* years, for to furnish himself with a competent knowledge.

XI. Man, as he is alone, is a melancholly creature, and therefore needs a futable companion to cheer him, whereby he is the better disposed for to receive a greater happinesse. The futablenesse and delight, which he findeth in his fellow, doth fix his thoughts and his actions, and thereby diverteth him from infinite occasions of falling into evil. On the other side, men, that are single, are much inclined to wandring, and exposed thereby to all manner of temptations; to covet illegal objects; to act unlawfull actions, to the hazard and danger of their lives; and above all to evil thoughts, which the Devil doth suggest to them. If every man did adhere to a futable companion, he could hardly commit evil: I mean sins of commission: for being prepossessed through the pleasing fellowship of his Consort, he could not covet any thing which was illegal: for did he covet any thing else above that which he doth enjoy, it supposeth a greater convenience in that object, which he doth covet: but since that, which he hath made choice of, is, next to the *Summum Bonum*, most futable to him, he cannot let his desires slide another way. The worst actions, which men do act, are either when they are alone, or when they are in other company, and absent from their partner. When they are in other company, they are apt to be drunk, to swear, and to project base designs, which a man seldome or never doth perpetrate in the presence with his mate. Or if he did, it is an hundred to one, if her fear, modesty, or some other

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vertue did not prevent him. Man could seldome think evil thoughts, because his companion is supposed to divert him in proposing pleasant or usefull discourses. What woman is there, which can be inordinate in any of these fore-instanced actions, if she is suted to a mate, and adheres to his fellowship onely. 'Tis true, women and men, although both joyn'd in a constant adherence, have sometimes agreed in wicked designs; but this happeneth alwayes in a couple unsutably paired, and consequently much given to wandring; so that they did not contract that evil habit from themselves, but from others. Had the first man and the first woman continued constantly together, it would have been a far harder task for the Devil to have deluded them: but they being separated, although but for a few moments, and either of them admitting conference with the Devil, were soon corrupted. What an easie task of Government would it be, if most men were paired so, as never to be asunder from their fellow. They could hardly assent to mischief; or if they were bent to it, Law might sooner work upon their joint-interest, than if it were single. But take this only as by way of discourse.

XII. It is necessary among men to give honour to whom it is due. and to return it with thanks, when they do deserve it. Were it only to cause a distinction of persons, in respect to civil Government, it doth imply a necessity. It is proper for us to know what honour is; for how could we else acquit our duty in this part to God, to the supream Magistrate, or to our Parents?

XIII. We are not to be over-scrupulous in taking of an oath, provided it tend to the preservation of the Commonwealth, and that the supream Magistrate (be it the King, Prince, or plural Magistrate) do require it. We are obliged to it upon a double consideration: 1. Because the Magistrate doth command, or imposed it, which is obliging among all Nations. 2. Because it tends to the preservation of the whole body of the people. And this common reason doth convince to be binding.

CHAP. VIII.

Of the Subject of Natural Theology.

1. *Man consisting of Body and Soul is the adequate Subject of Natural Theology.*
2. *Reasons proving the Soul to be the original and principal Subject of Theology.*
3. *That the Understanding and Will are really and formally one. The confutation of the vulgar definition of Will. A full explanation of the Will, and the manner of its acting. What speculative and practical signifie.*
4. *What the Will is in a large sense.*
5. *What the Will is in a strict sense.*
6. *An Explanation upon the first description of Will.*
7. *The Effects of the Will. Whether appetibility doth not equally imply volibility, and appetibility in a strict sense.*
8. *Whether mans appetite is distinct from his Will.*

I. **T**He fourth Question proposed is, Which is the Subject of Natural Theology? By Subject I mean the *Subjectum inhaesivum*, wherein this habit is inherent. To answer you in general, The whole man, as he consisteth of soul and body, is the subject of Theology; for the effects of it, to wit happinesse and joy, are as sensibly received by the body, as by the soul: for the body receiveth its essence, conservation, and bodily pleasures from it *. The soul cannot alone be properly said to be the subject, because the soul without the body is not man.

* Namely from Theology, that is, from its nearest end, or *Summum Bonum*.

II. The soul is originally and principally the subject of Theology. I say originally, because the soul is the original cause of the pleasures of the body: yea, and of its constitution: for the body was created for the soul, and not the soul for the body. The soul is the original cause of the pleasures of the body, in that the soul doth make choice of them, and applieth them to the body: for example, meat, drink, and other pleasures are applied to the body, in that the soul makes choice of them, and conceiveth

conceiveth them to be pleasant to the body; otherwise the body could not attain to them. The soul can enjoy pleasures, when the body is in pain; but the body cannot, when the soul is in pain.

The soul is the principal subject of Theology, because the greatest happiness and good is enjoyed by it, the delights of the body not being comparable to them of the soul, The soul receiveth its pleasure by instants of time; the body onely by succession.

III. The operation, whereby the soul doth imbrace the greatest good and happiness, is from the understanding, as it is speculative and practick, and not as it is a two-fold faculty, formally distinct through the understanding and the will; for these are not really and essentially distinct. I prove it: if the understanding cannot understand without the will, or the will without the understanding, then they are not really and essentially distinct: because it is proper to beings, which are really and essentially distinct, to operate without each other. But the understanding cannot understand without the will; neither can the will without the understanding. Therefore they are not really distinct.

I prove the *Minor*: The will is primarily a bending of the understanding to an action of the mind; but the understanding cannot understand, unless it bends to that action of the mind: So neither can the understanding be bent to action, unless it understandeth. Wherefore the one doth imply the other. The most there is between them is a modal distinction.

You may object, that it follows hence, that a man may be said to will, when he understandeth, to understand when he willeth: which predications are absurd.

I answer, That it includes no absurdity at all: for a man, when he understandeth, doth will every particular act of the understanding, which he understandeth, or otherwise how could he understand? On the other side, a man understandeth, when he willeth according to that trite saying, *Ignoti nulla Cupido*, That which a man doth not know, he cannot desire or will. Wherefore I argue again, that the one includeth the other, the will implyeth the understanding, and the understanding the will. Possibly you may deny my supposed definition of will, which is a bending to an action of the mind. If you refuse it, propose a better.

Your opinion, it may be is to wander with the multitude, and so you commend this: The will is, through which a man by a fore-going knowledge doth covet a futable or convenient good, and shunneth an inconvenient evil.

I will first account the absurdities of this definition, and afterwards prove them to be so. First, you affirm, That there fore-goeth a knowledge before a man willeth. Secondly, That a man doth alwayes covet a convenient good. Thirdly, That a man shunneth all inconvenient evil. Fourthly, That the will alwayes either coveteth or shunneth. Fifthly, The definition containeth superfluous words, as inconvenience and convenience. Sixthly, You assert that two contrary acts proceed from one formal habit. Seventhly, This definition is a division of a habit into its acts. Eighthly, You do positively affirm, That the will is really and essentially distinct from the understanding. Many more I might deduct, but these being sufficient, I shall now direct my pen to them particularly.

First, You say, That there fore-goeth a knowledge before every act of the will. Upon this I demand from you, How cometh the understanding to know? You may answer, through her self: and what is it else, to know through ones self, but to know through ones own will? *Ergo*, The will is a concomitant of the understanding, and the understanding of the will, and consequently the one doth not precede the other. Or thus, Can the understanding know against her will, or without her will? If so, then man is no voluntary creature, in that he acteth, without a will.

Secondly, You declare, That a man doth alwayes covet a convenient good. Herein you contradict your self: for before you said, that the understanding did understand a volible object without or before the will: but to understand a volible object, is to will to understand it, and yet not covet it: Therefore according to your own words, a man did not always covet through his will. 2. A man doth covet evil as evil: Wherefore he doth not alwayes covet good. The antecedence I have proved above. 3. A man doth sometime covet an inconvenient good: for he covets Arsenick to kil himself. You will answer to this, that he doth covet it as a convenient good, for to ease him from some trouble or grief. By this solution you confound your self, in taking objective good and formal good for the same thing, which according to *Aristotle* are different. If so, then
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your answer will not hold : for the Question is concerning objective good, whereas your answer relates to a formal good. The ease, which a man findeth through the removal of trouble, is the formal good, the Arsenick is the objective good : this presupposed, the Arsenick is good in it self, but relatively it is inconvenient to that man, for it destroyeth his essence. You may reply, That a man doth not take it to destroy his essence, but to release himself from his misery. Notwithstanding I say, he knew before he took the Ratsbane, that it would kill him ; wherefore this knowledge of inconvenience fore-going the willing of inconvenience, doth according to your own definition infer that he willed it, as inconvenient, because he fore-knew it to be inconvenient.

Thirdly, I say, That a man doth not alwayes shun an inconvenient evil : because he doth not shun sicknesse, when he is diseased : neither can he shun all inconveniencies ; for he falleth into many. So likewise in the fore-given instance, he cannot shun sicknesse or death, although he may wish it remote from him, but that is not shunning of it : wherefore shunning is an improper term to be used in this definition.

Fourthly, You conceive, That the will alwayes doth either covet or shun. This is against most *Peripateticks*, who say, that the will can suspend its action, which suspension is neither coveting or shunning.

Fifthly, Since that good implieth convenience, and evil inconvenience, what need you to adde convenience and inconvenience : Wherefore both must be superfluous.

Sixthly, To shun evil and to covet good, are two acts formally contrary : If so, How can these flow from one habit ? Possibly you endeavour to escape the force of this Objection, in saying, that the one may proceed *per se*, and the other *per accidens* from a formal habit. If I should grant this, your definition will prove illegal, because there must nothing be inserted into a Definition, but what agreeth *per se* with the *definitum*.

Seventhly, This is rather an Accidental Division of a habit into its acts : Wherefore this Division is not so much as Essential ; because it is not grounded upon the form of the *Divisum*.

Eighthly, You conclude the will to be really and essentially different from the understanding. You make too much haste; you should first shew, that the will and understanding are Real Beings; and how will you do that according to your own received Doctrine of Real Beings? which teacheth, that they onely are Real Beings, which exist, or can exist without the understanding: if so, then the understanding, for to be a real being, must exist without its self; and is not this absurd?

Having made appear to you the falsity of the common Doctrine of Will, I come now to explain, how the understanding is made practical, and how speculative.

Wherefore in the first place, Mark, what the understanding is. The understanding is the discerning, apprehending, or judging faculty of all Objects, which are objected from without, or from within. The understanding judgeth of these objects according to their distinct representation. Objects represent themselves in a two-fold manner: 1. Essentially, when the essence consisting of all its modes united is represented to the understanding. 2. Modally, which is, when one mode or more, is, or are singularly represented to the understanding. You may apprehend this better by an example. The essential representation of a Bull is, wherein you perceive him by, or in all his modes united; particularly in perceiving him in that shape, of having such a figure, of bearing horns, of being hairy and cloven-footed, of having unity, truth and perfection, &c. But when I conceive onely one of his modes, without conceiving any of the others, that is a modal representation; as in conceiving his horns only, or the goodnesse of every mode by it self, or the goodness of the whole essence. Observe then, these several concepts are several actions, because they are of several objects: Which difference of action is called a material difference.

Again, This action is but one formally, and depends from one formal power; so that one power can promote but one formal action: as in this instance; The power, which my hand hath of writing, fitteth it to write several letters, as *I. D.* &c. the writing these several letters are distinct actions, because they differ in figure, which is a material difference: but then again, the action of writing is but one formally, flowing from one formal power of writing. So likewise a knife cutteth paper, wood, &c.

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the cutting of these are materially distinct actions; but again the cutting is also but one formal action; for a knife cutteth these through one vertue of sharpnesse, and therefore its power is but one formally. In the same manner, I say, doth the soul understand or perceive several objects; as, in conceiving the entire essence of a Being; or its modes in particular; as its goodnesse, unity, &c. These are all several actions differing materially one from the other; for the conceiving of unity is not the conceiving of Good, &c. Again, The action of understanding or conceiving is but one formally flowing from one mind, or one understanding faculty, otherwise were it double, it would require a double name. Moreover, there is but one first and formal faculty of all beings; because all second faculties are derived from one: and what is this faculty in man, but the understanding? Whence it appeareth, that the understanding faculty is one formally, and manifold materially: or rather to speak more properly, the understanding faculty is but one, and its acts are many. According to this last Caution, the understanding cannot be said to be speculative, or practick; but its acts are either speculative or practick. Or thus, The understanding is formally only speculative; I mean speculative, as it is taken in an universal, indifferent and unlimited sense. Further, The understanding is materially also speculative and practick. By speculative I mean an absolute and single habit of conceiving an Essence or Mode, without any other duplicated and relative action.* Practick is attributed to the understanding, when it acteth (that is understandeth) upon an essence or mode by a duplicated and relative action. A relative action of the understanding is, when it considereth, and understandeth an object relatively, or related to another object, which among the most universal attributes of a being is goodness. So that to understand a being practically, is to understand it to be good, and related through that goodnesse to another being: as when I understand an Ox to be good for plowing, carrying, &c. I consider him relatively, as related to another being: Now then, this I call a practick Act of the understanding, and from such acts is the understanding termed practical. Hence let us examine, What difference there is between these two objects being variously acted upon by us, and wherein they do agree. The difference which there is between them ariseth from themselves, and is that the one

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is understood not to be the other: They agree in that they were apprehended or acted upon by one faculty of the mind, or that they are objects of one and the same faculty of the mind. The distinction, which there is imagined in the faculty is none, for it is the same faculty that understandeth a thing to be good, to be true, &c. A Looking-glasse is not changed from being a Glasse, because it represents several essences and modes; as faces, hands, or legs: so neither is the understanding different or changed, because it discerns several objects.

It may be one may say, that this is not the case; but whether this practical understanding is the will, or not, is the doubt: for the will, you may imagine, is Actually to move, or to act that, which the understanding hath conceived convenient: When a man conceiveth a thing to be good; as in the before-mentioned instance of an Ox to be good for the plow, it is the action of the understanding, as it is practick; and this cannot be called the will; but the will is, when you act that, which the understanding hath conceived expedient to be acted; as, when you put an Ox to plow after you have apprehended him to be good for it, doth issue from the will; and is, as it were, a command of the soul upon the inferiour faculties to do that, which the understanding hath perceived to be practick: So that practick is that, whereby we act, and not whercby we may act. The understanding is named practick, because thence the soul may act that, which the understanding apprehendeth practick. The will is more properly termed practick, because thereby the soul doth act: for *τελεῖς* signifieth action, which (according to *Aristotle*) is either immanent or transient: so that *Praxis* in a large sense, is predicated of *πείρασ* (which is vulgarly referred to a transient action) and of *Praxis*, as it is strictly limited to an immanent action.

To remove this Objection, you must consider these notions:

1. That the soul is a single Being, and therefore hath but one formal single power, which formal power seemeth (but really is not) to be different from it self, in that, in the brain it understandeth; in the Liver it sanguificateth; in the Muscles it moveth. These are onely external and material differences; not formal; for it is one and the same faculty of the soul, which moveth, understandeth, &c.

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2. This Question may be taken in a double meaning: 1. Whether the will and understanding, in respect to the soul, are different faculties? That is, Whether the soul doth understand and will by two powers differing in themselves? This is made clear in the Discourse of Powers. 2. Whether these faculties in respect to themselves are really different: to wit, Whether to refuse or imbrace an object, which are the acts of the will; and to judge or apprehend it to be imbraced or refused, which is the act of the practick understanding, are different acts; and consequently proceeding from habits materially different. Now, take my answer.

I say, That to will and understand an object practically, are acts really identicated, and proceed from one faculty of judgement or understanding. I prove it. To make an impression from within, upon the phansie, is an act of the intelligent faculty; but to will and understand practically, is caused by an impression from within upon the Phansie. *Ergo*, They are caused or proceed through one and the same act, from one and the same faculty, which is the understanding. I confirm the *Assumption* by this instance: When a man doth will meat: 1. He makes a practical science upon it, and judgeth it to be good or convenient for his body: Next after this, he doth judge it necessary for him; as, to eat, when his stomach is hungry: 3. He judgeth the means, whereby to procure it, to be a local motion; as, through which a man doth move towards his meat, and moveth it unto his stomach. 4. He judgeth, That to make a motion to an object, is by moving the spirits of the phansie towards that object, which motion excites all the other spirits, contained in the external members, to move to the same object. Lastly, To judge is to be moved by an impression of any *species* upon the phansie, which the Agent understanding made thereon: so that these four judgements of the understanding are impressions and motions upon, and in the phansie, which being constituted, the will is also constituted. You may then observe, That the will is not a single act, but one act composed out of many single acts, and united one to the other by a subordination. All these four motions concurring to a will are effected by one faculty, and therefore are not different. These four acts are (as it were) parts, which constitute a will: for one being deficient, a man cannot will, unlesse

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he judgeth an object to be good; he cannot covet it, neither will he covet it, unlesse he judgeth it necessary to make up a pleasure, or to supply a need; for there are many things, which are good, and yet we do not covet them, because we do not judge them necessary for to make up a pleasure or need. These two are to no purpose, if the apprehension of means be not framed.

The understanding being now bent and inclined to an object, makes an impression upon the animal spirits lodged within the seat of the phantasie: for how can the understanding otherwise judge of means, unlesse it makes an impression of them upon the phantasie? which is no sooner done, but all the members move. The Phantasie is like unto the spring of a Watch, which being moved, all the wheelies are moved by it. All these acts, we see proceed from one agent intellect, and are all acts of that faculty, and why should they then be counted to be really different from one another?

IV. 1. The *Will* is, whereby the understanding of man is inclined to action. The will, as I have shewed, is an act of the understanding, wherefore I do define it by the understanding faculty. Note that *Will* here is the same with the practick understanding.

V. 2. The *Will* (in a strict sense) is an action of the understanding upon an object, as farre as it is appetible, or inappetible.

Will in the first definition is supposed to be the inclination or motion of the understanding to action: That is to any action in general; whether to good or to evil; to a single, or reflex action; to one single or many actions subnected to one another. The understanding, when it doth understand, it first willet and inclineth to that action, before it can be said to understand: if then, there be any priority imaginable between the understanding and the will (as scarce there is) the will must precede the understanding. But, as I said, there is none: because inclining to action, and to be in action are the same thing: neverthelesse we may suppose them to be distinguished *ratione*: and a *parte Rei* they are distinguished materially.

Here may be objected, that that, whereby the understanding is inclined to action, is the object: for it is the object, which doth

doth incline the understanding to action: Wherefore the object is the will, which is absurd. You have almost rightly apprehended my meaning; it is true, that through the object the understanding is moved to action: for without an object the understanding could not act: And from the object is the understanding said to act, and receiveth the denomination of acting from it: but now, it doth not follow, that the will is the object: yet materially it is in the object; formally in the understanding.

You may furnish your self with another objection, which is, That it followeth hence, that the understanding is alwayes practick, and never speculative.

To this I answer, That practick either implieth action, and a bending to action, whether the object, in which that action doth terminate, be within, or without: or the Acting and bending only to an external object, which action upon an external object is not single but many; besides it must be also related to the goodnesse of an object: according to the former implication the understanding is alwayes practick, when it doth understand, according to the latter it is not.

VI. The second definition is more strict and limited, the will here being determined either to an appetibility (which denoteth either a convenience primarily, or a farther constitution, preservation and perfectionation, pleasure, or goodnesse in the object; secundarily and *per accidens*, an evil and imperfectionation) whereby the understanding is incited to a second and farther action; or inappetibility. Scaliger in his Cccviith Exerc. 3. D. defineth the will very consentaneous, to what it is set down for here. *The Will* (saith he) *is the understanding extended to have, or to do that, which it apprehendeth.* By this he consenteth, that the will and understanding are the same really. That, which he intendeth by an extended understanding, is before implied by a farther and second action of the understanding. It is a true saying of his, That the will is the understanding extended, or judgement prolonged: for when one doth ask you, whether you will go to sleep; first, you judge what sleep is, then you prolong your judgement in judging sleep to be necessary; thirdly, you extend your concept, untill you conclude that you will go to sleep; and what is this, but the understanding prolonged.

By a farther Action, the will is distinct from speculation, whereby an object is conceived only by a first intention, without the consequence of any farther action: By action, I intend effect, or doing.

VII. The acts of will, in a strict sense, are to embrace, or to reject an object.

The object of the will is a Being, as far as it is appetible, or unappetible. This faceth somewhat against the customary speech of Philosophers, who attribute appetite primarily to animals and naturals: and secundarily to man; if so, then appetibility is not the *ratio formalis* of the object of the will, but of the appetite. So that volibility (if such a word might be suffered) is rather the proper object of the will. Herein are two questions contained. 1. Whether appetibility be not a word equally denoting volibility and appetibility in a restrained sense. 2. Whether man's appetite is distinct from his will.

To the first I answer, That appetibility is equally attributed to man, and to other creatures: I prove it: *Aristotle* defineth Good to be that, which all beings have an appetite unto: if so, then appetability is common to man, since that man is a Being, and hath an appetite unto Good.

IX. The second doubt is somewhat more involved in bryars. *Scaliger* in the same *Exerc.* alledged in the next fore-going Paragraph, states a difference between the appetite of man, and his will. For appetites (saith he) are propensities to natural conveniences: with which we are born, like as with our senses: wherefore the appetite is moved either from our sense, or fancy, or memory; from which again that power is moved, which we call the will. Wherefore the appetite is before the will, that is, before that act, whereby we will a thing. Thus farre *Scaliger*. If this be true, it is a Paradox, that one and the same object through one formal manner of moving should move two formal powers of one Being. How can this be? One being hath but one formal power, whereby it is distinct from all others. So man hath but one formal power, which is his power of reasoning, through which he is distinguished from all other beings: Wherefore the appetite of man is not distinct from his will. But *Scaliger* saith, That the appetite is sometime checked by the will. Ergo, They are different. The Antecedence is evident in this instance: A man doth frequently

quently long for a thing, which his will doth contradict; as in coveting for drink, when he hath a drowth, or in longing for sack in a fever, the will doth not alwayes assent to it: Wherefore the will is different from them appetites, because the one can be existent without the other

In answer to this I say, that these are not properly appetites, to which (namely appetites) a knowledge doth necessarily concur; but they are only improperly and analogically termed appetites, because they agree with a proper appetite in having an inclination to a thing. Wherefore a proper appetite being alwayes concomitated by a knowledge, these fore-mentioned instances cannot be denominated appetites, but natural inclinations and propensities: for if a man is predicated to have an appetite for any thing, it is equivalent, as if he were predicated to have a will to a thing: Wherefore there is only one proper appetite in man, as he is man, which is his will.

CHAP. IX.

Of Free-will by Reason.

1. *Wherein man doth most differ from Animals or Naturals.*
2. *To what acts the freedom of man's will, in reference to its acting, doth extend. What the freedom of will is, quoad exercitium actus, and what Libertas contradictionis is.*
3. *What the second kind of freedom of will importeth.*
4. *That the speculative understanding in the act of speculation is practick.*
5. *That the will is not constrained to will a good thing, although present: but hath a power of rejecting it.*
6. *That the will willeth evil for an evil end. That some men are worse than Devils.*
7. *What the will's freedom is in specifying its acts.*
8. *What free-will is in reference to its faculty.*
9. *Velen rejected for asserting that the will is not indifferent to each contrary. That the will is indifferent to each, contradictory opposite.*
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10. *That the will is free to act, or not to act.*
11. *That the will is free to act upon particular objects, whether good or evil. The state of the controversie.*
12. *That man as he is in a natural and corrupt state hath a free-will of doing a moral good, or a moral evil act.*
13. *That man hath not a free-will of doing a theologicke good act immediately through himself without an extraordinary concurrence of God with him.*
14. *Man hath a free-will of doing a theologicke good act with an extraordinary concurrence of God with him. That he hath a free-will of election.*
15. *That man, as he is in a natural state, hath a free-will, through himself, and without Gods extraordinary concurrence, to procure Gods extraordinary concurrence and assistance to him in his actions. That our being and conservation in it, and all our actions depend from the ordinary concurrence of God. Reasons, why God did not conferre upon him an absolute power of acting without his ordinary concurrence. The cause of man's fall. That that which is only morally good will prove theologicke evil at last.*
16. *Arguments to prove a free-will in man. A reconciliation of the Calvinists with the Arminians. That man hath a remnant of theologicke good surviving in him. The state of the controversie. The division of it.*

I. **T**He chief respect, through which a man doth differ from Animals or Naturals, is his will, which is a free principle, through which he acteth freely, that is, without any irresistible impulse; for there is no object, whether good or evil; pleasant or sorrowfull, but it is left to the wils freedom, whether it will imbrace it, or reject it.

II. The freedom of man's will, in reference to its act, is either a determination or assent, of man to act, or not to act: or else it is an assent to act upon a certain object, or not to act upon that certain object: or to act upon a certain mode of an object, or not to act upon that certain mode: or to act upon the goodnesse of an object in common, or particular, or not to act upon the goodnesse of such objects: or to act upon the evil of an object in common or particular, or not to act upon the evil of that object; or to act upon good, or upon evil.

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These are the particulars, whereunto the freedome of man's will doth extend.

And first, A man hath freedom of acting, or of not acting, through his will. A man in willing to sleep, he willeth to will no more, before he hath refreshed himself by sleep. So that herein a man hath a will of acting or not acting indeterminately, which sort of willing freedome is termed, *Libertas quoad exercitium actus*. Such a freedome of will there is in man: for a man in willing to sleep willeth not to will, that is, not to act through his will. A man in willing not to sleep may will to will, or to continue in action of willing or understanding. This is a plain *Libertas contradictionis ad actionem, & non actionem, sive ad agendum & non agendum*: for it is between an *ens* and a *non ens*.

III. The second kind of freedom in the will is to act upon an object: I mean a whole essence or object, as it doth consist of all its modes united: as for instance, a man may covet a whole Tree, or only a branch of it; a whole house, or only a room. Now in coveting a whole Tree, or a whole house, he coveteth an entire essence with all its modes: or else a man may also reject a whole Tree or house, and so rejecteth a whole essence.

IV. Thirdly, The will may choose to act upon a particular mode, as the truth or quantity of an essence, &c. For it makes choice to act (that is to apprehend or contemplate) upon these modes particularly. Neither let it seem strange to you, that the understanding or will in contemplation should be termed willing or practick: for in that very contemplation the understanding is practick, for it doth both act and will that action.

V. Fourthly, The will may act upon the goodnesse of an object in particular, or it may refuse it. Herein I do thwart some Authours, who strive to prove the contrary, to wit, that the will, when it doth act upon a good object, it cannot refuse it, but doth alwayes covet it. Others do with more caution assert, That the will of man cannot reject or refuse the most universal good; for which purpose they quote *Austin*, 10. B. 20. Chap. of Confes. *Were it possible* (saith he) *to ask all men at once, whether they would be happy? they would answer without any further pausing upon it, they would.* But suppose this were granted (as really it is disputable, there being many in the world so wicked, that if they

were

were invited to imbrace the true *Summum Bonum*, either for to bid adieu to their own spurious happinesse, or to wave their obstinate opinions; they would rather excuse themselves; as I once heard a Jesuite cry out in a dispute, *That he would sooner choose to be damned with St. Austin, then go to Heaven with a Protestant.*) Yet they need arguments to prove that a particular good may not be waved, although perceived by the understanding: How many are there, who neglect and revile many good things, such as are convenient for their souls and bodies? Besides, this granted infers a necessity upon man's will, whereby he is cut off from not willing; which implies a contradiction in the will of not to be the will.

VI. Fifthly, The will acteth upon the evil of an object, in that it can refuse or imbrace it, as it is evil, and as it knoweth it to be evil, without having an apprehension of any goodnesse in it. A man can hang himself, or kill another, without apprehending any thing good in it, and he can also refuse it. Since that all beings act for an end and purpose, it may be demanded, What end and purpose can a man have in coveting an evil object, as it is evil? I answer, an evil end. The Devils covet evil, as it is evil; for none can imagine the least good in Devils: if so, why may not men covet evil as evil, many among them being worse than Devils. It is worse to persevere in evil and wickednesse in the midst of the enjoyments of good things, than to affect evil without the least enjoyment of good; but Atheists persevere in the greatest evil in the midst of good things; wherefore they are to be accounted worse than Devils, who affect evil without the least enjoyment of good.

VII. Lastly, A man may will either a good object or an evil one. This is an action of will, as it is free to contraries, and is called among Philosophers (*Libertas quoad specificationem actus*) a freedom of will in specifying an act, that is, an affecting an object in particular, as it is opposite to another appetible object in contrariety; which is to will an object, as it is good, or as it is evil; pleasant, or sorrowfull, &c. The preceding distinctions of the acts of will, proceed from her, as she is free *Quoad contradictionem*, or *quoad exercitium actus*.

VIII. Hence you may know, that free-will (*Liberum arbitrium*) in reference to its faculty, is an indetermination or indifference

ference in the will of man of acting or not acting, and of acting upon good or evil. Neverthelesse it is a controversie among Moralists: 1. Whether the will be indifferent to each opposite, which opposites are either between contradictories, as between acting, and not acting: or between contraries, as between acts upon good or evil. 2. Whether the will is free in all its acts. *Wilfen. Cent. 1. Dec. 4. q. 6.* states two conclusions for the resolving of these doubts. 1. Saith he, The will is not indifferent to each contrary, to wit, to good and evil. His reason is, because the will cannot covet evil as evil; but when the will doth covet evil, it is rather forced than free, because it is an evil disposition doth compell her to it: wherfore that being against nature, it is rather to be accounted violent than free. First, He saith, The will cannot covet evil, as evil: Next he affirms, That the will can covet evil, but then she is forced. This is a manifest contradiction, that the will can covet evil, and cannot covet evil. Again, That the will should covet evil by coercion from within, is to contradict most Philosophers, whose tenent is, That the will cannot be forced from within: Besides, to grant this, would be to suppose that man did act necessarily, like unto naturals. Further, it would be very severe, should God punish us, for doing an act, when we cannot do otherwise.

I X. His second Conclusion is, That the will of man is indifferent to each contradictory opposite: because she can act upon a good object in particular, and forbear. Herein he speaks the truth: but this is no more truly concluded, but it is as fallaciously opposed by others: Their Argument is, because souls in Heaven cannot but love God, and the damned cannot but hate him: both these acting freely, it followeth that the will is not indifferent to contradictories. This infers nothing to the present dispute of man's will, only of souls in Heaven and Devils. But I passe to the second Doubt proposed, Whether the will of man is free in all her acts. In order to the clearing of this doubt, you are to observe it. 1. That the acts of the will are of acting, or not acting; or of acting upon a particular object, so as to covet it, or to reject it. 2. That the act of the will after its whole assent or conclusion, is not the will it self, and therefore freedom is not to be attributed to the act, but to the power or faculty. This premised I pose,

X. 1. That the will is free to act, or not to act. If man is free to think, or not to think, he is free to will, or not to will; because a man's thought is alwayes concomitant to his will. But a man is free to think, or not to think. *Ergo*, He is free to will or not to will. The Assumption is confirmed in the second Paragraph.

XI. 2. The will is free to act upon particular objects, as they are good or evil. By will I mean the will of man, as he is in a natural and corrupt state, not as he is in a supernatural or preternatural estate; for in the first he cannot covet evil; in the last he cannot covet good. Neither is it to be understood of man, as he was in an incorrupt state, most granting, that he could covet good and evil: But the Question is, Whether man as he is in a corrupt condition, and prone to evil, cannot do a good act, as much as the first man being prone to good did an evil act. Observe also that good is either theologick good, or moral good: and so is evil. The Question here is concerning moral good and evil. Lastly, you are to understand here the freedom of man's will, as he acteth with the ordinary concurrence of God: and nor, as he acteth, with an extraordinary concurrence of God with him.

XII. Man, as he is in a natural and corrupt state, hath a free-will of doing a moral good act, or a moral evil act. What moral good and evil, and theologick good and evil is, I have already set down in the 3^d, 4th and 5th Chapters. I prove this position What ever a man doth act with the fore-knowledge of his understanding, doth proceed from his free-will: But man acteth moral evil, and moral good, with the fore-knowledge of his understanding: *Ergo*, Man doth act moral evil, and moral good through his free-will. I confirm the *Minor*: There are none that deny, that man doth moral evil with the fore-knowledge of his understanding. That man doth act a moral good act from himself without an extraordinary concurrence of God with him, it appeareth; In that he can and doth covet meat and drink in moderation; and in that he can and doth help the poor and needy; and in that he can moderate his passions: all these are moral good acts. They are good acts, in that they do perfectionate man in his Essence: They are moral, in that they proceed from man's free-will, and fore-knowledge.

XIII. Man

XIII. Man hath not a free-will of doing a Theologicke good act immediately through himself, and without an extraordinary concurrence of God with him. A Theologicke good act is such, as God doth require from us, and as he first gave man a power of acting it: since then we have not such a power, as God first gave unto man of acting good: it followeth, that we cannot act such good acts through our selves, as God doth require from us.

XIV. Man hath a free-will of doing a Theologicke good act with an extraordinary concurrence of God with him. If God doth concur with man in his actions in an extraordinary manner, no doubt but God can and doth make them Theologically good, that is, good in the highest perfection; and such, as he himself doth require from us. Man, being so assisted through the extraordinary assistance of God, acteth freely notwithstanding; for it is still in his choice, whether he will do such a Theologicke good act or not. When God doth assist us in an extraordinary manner, it is not without our free-will; for we must first will and desire it with a burning desire, before God will assist us, which burning desire doth move him to assist us; neither will God refuse us, because he is most good, and most mercifull. Now then, when this desire ceaseth in us, then Gods extraordinary assistance ceaseth with it; if then we can forbear this desire, and continue it, we have still our free-wills. Besides, we also have a free-will of election, that is, of making choice of one good object before another.

XV. I. Man as he is in a natural state hath a free-will through himself, and without an extraordinary concurrence of God with him, to procure Gods extraordinary concurrence and assistance with and to him in his actions. The means, whereby a natural man doth appropriate it, is by fervent prayer: so that man having a free-will of procuring Gods extraordinary concurrence, hath a free-will mediately to act a Theologicke good act. Before I prove the first branch of this sub-Conclusion, you are to mark, that we can do no action at all, through our selves alone, without the ordinary concurrence of God with us: for God hath not given us an absolute power of being and acting, without the concurrence of his preserving and assisting power; if he had, he would have given all the power over us out of his hands, which is impossible and unsuitable to the King of Kings to give

away all his Glory, Honour and Dominion. Again, had he done so, we should have returned the thanks due for so great a goodness, in envying and reviling of him. Wherefore it followeth, that God hath reserved a preserving and assisting power to himself, without which we cannot continue in our beings, or do any action. If the first man could have beer, and acted through himself, and that without Gods assistance, he could never have died, but since that he died, and could not maintain himself in his being, and in that most perfect Essence, wherein he was created, without adhering to Gods power; therefore he having deserted that power but for a moment, and confiding upon his own, immediately fell, and was almost utterly corrupted and lost: if then that the first man in that perfect Essence could not subsist or act through himself alone without Gods aid, much less can we in this deflected state, and weak nature, subsist or act without Gods assistance. This assistance is Gods ordinary assistance, for were it extraordinary, we should then act as perfectly as the first man did before his deficiency.

2. After the probation of the necessity of Gods ordinary and extraordinary concurrence, I come now to prove, that man, being assisted with Gods ordinary power, can and doth procure Gods extraordinary concurrence. Man, as he is in a natural state*, may and doth know, that he hath still some spark of Theologicall good remaining in him; for all men can and do know naturally, that there is a God; that there is a Law enjoined by God upon men, as his subjects; that that Law is perfect; that his actions are observed and acknowledged by him to be evil and sinfull; that through himself, without Gods extraordinary aid, he cannot act that, which God doth require from him; that God is Almighty, good, and mercifull, and therefore God will not deny any request of good, proceeding from a spark of Theologicall good, because therein man hath still something in him, through which he resembleth God, which God will not abolish, and hath tyed himself through his bountifull promises not to destroy. All these acts and knowledges proceed from a Theologicall good principle, and therefore man is partly Theologically good, to whom, if he useth that natural power and means remaining in him, God will not deny a supply against his defect. The natural power and means, which a man doth naturally and ordinarily put in action

*For even then he is assisted with God's ordinary power.

to procure Gods extraordinary assistance, is his power of praying with zeal and earnestness: for a man whenever he is in danger, great need, and intollerable pain, doth naturally beg and implore help. Therefore a zealous and earnest praying is a natural power, (which nature doth prompt us to) and means to procure Gods extraordinary assistance.

Lastly, From all this it is undoubtedly true and evident, that man through himself, and with the ordinary concurs of God with him, doth and can procure Gods extraordinary assistance, Which having procured, he hath a free-will of acting theologick good.

3. That which is only morally good, will prove theologick evil at last. A thing may properly be said to be good, although at last it changeth into evil and corruption; for as a Tree, which is a good natural thing, changeth to an intire corruption, when it dieth: so a natural man whilest he liveth is morally good, and doth moral good acts; but when he dieth, he becomes entirely corrupted, and altogether evil, that is, theologically evil.

XVI. 4. To shut up this succinct dispute of free-will: I say, That man without free-will is no man, but a Beast: That man might justly be excused for his evil acts: for had he no principle, whereby he acted freely, but did act necessarily and by compulsion or coercion of the Divine power, he could not act evil, it being impossible to God to act evil; or if man did act evil, it would be without a will, and therefore it could be no sinne: that man could not be termed the cause of his moral actions, but God. Many other inconveniencies and absurdities do ensue in denying this truth, which to produce will prove tedious. By this we may easily reconcile the *Calvinists* with the *Arminians*. The *Calvinists* may rightly say, *That man through himself cannot act a good act*, that is, cannot act a theological good act, with the ordinary concurrence of God only. The *Arminians* may with no lesse confidence assert, *That man hath a free will of doing good through himself*, that is, hath a means and principle resting in him, whereby he may mediately do a theologick good act through himself, and by that means may procure Gods extraordinary concurrence: but the greatest controversie, probable to arise between them, in my opinion is, Whether a man hath a free-will,

or a remnant of theologicall good in him, whereby he may procure God's extraordinary assistance through himself; or whether God doth stirre up that spark of Good, being moved through his own mercy, and not by what can proceed from man: for many hold, that man hath no spark of Good remaining in him, and consequently cannot be thence supposed to have a free-will to beg God's extraordinary assistance; but it is God, who doth out of his singular goodnesse, free-will, and pleasure, towards singular men, cast, and infuse a measure of theologicall good in them, through which they are made capable of having access to God, and of praying to him: and this they say Scripture implies by a *new creation*, *regeneration*, *conversion*, or the *becoming of a new man*.

No doubt but this latter tenent is erroneous and absurd.

First, They affirm, That man hath no spark of theologicall good remaining in him. This is false, as hath been proved already, and shall be demonstrated more at large elsewhere.

Secondly, Hereby they imply, that man doth alwayes act evil, and consequently acteth evil necessarily without a free-will: And wherein doth he then differ from a Beast?

Thirdly, Should God cast his mercy or goodnesse upon that, which is altogether evil; it followeth, that God should love that, which is altogether evil; but that is repugnant to God's nature, that being most good doth necessarily reject that from it, which is most evil.

Fourthly, Should God stirre up that spark of Good in man, it proveth, that that Good is of no efficacy, and for no purpose, which is repugnant to common reason, concluding, that all things, which are, are for to operate, and for an end, and are not in vain: Therefore this spark of Good doth, and can operate for an end, to save it self, and glorifie God: especially being accompanied with God's ordinary concurrence, it is directly, as by a guide, led to God's extraordinary concurrence and assistance. So then, if there be a spark of theologicall Good remaining in man, as without doubt there is, it is of the same Nature with that, which was in the first man before his fall, who having a free-will to good and evil, infers, that this spark must necessarily retain the same free-will to good and evil, but in an impropor-

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nable manner, since that man's will is much more habituated to evil, which doth much dead that weak remnant of good in him. It is certain, God doth equally impart his mercy and goodness to natural men, because they are of an equal state: Then again I object; If so, then all men would become theologically Good, which is erroneous: Wherefore I say, God is no more good or mercifull to one natural man, than to another, and consequently there must be somewhat in men, whereby one doth move God to mercy before another; and what is that, but that spark of Good? Notwithstanding this inference holds good only *ordinarily*, and doth not infer, but that God *extraordinarily* may be pleased out of his free-will and pleasure to conferre bounties and mercies upon those to whom he will be bountifull and mercifull.

XVI. 5. It is a simple Question to demand, Whether the will is free at that instant, when it acteth; which is as much, as if you enquired, Whether the act of the will were free. Certainly, there can be no freedom allotted to the act or effect of an efficient: for that followeth necessarily. *Posita causa ponitur effectus*. The cause being stated, the effect is also stated. By the act of the will I mean the consent of the will, or the last execution of it: which is named *Actus imperatus*. But if the Question be understood *De actu eliciendo*, then no doubt, but the will is free at the same instant, when it acteth: for when would it be free else, were it not when it acteth? This Query may be apprehended thus, Whether the will is free: that is, Whether it doth not act necessarily *è suppositione*. *Neccitas è suppositione* is, through which the will cannot act otherwise than it acteth, when it doth act. According to this supposition it doth act necessarily: *Nam impossibile est idem simul esse & non esse*: For it is impossible, that a thing should be, and not be at the same instant. Neverthelesse this doth not clip any whit from the freedom of man's will: for freedom of the will is properly in *etum eliciendo*, and in *actum imperando*, but not in *actu elicitio*, vel *imperato*: that is, before the act is consented unto: for the will, before she consenteth to any act, can determinate it freely to either opposite. In short, the will is free in its faculty, but its acts are necessary.

CHAP. X.

Of Free-will from Scripture.

1. *Objections from Scripture against man's free-will.*
2. *An Answer to the said Objections.*
3. *Objections proving that moral good is evil.*
4. *The first Objection answered.*
5. *The second Objection removed.*
6. *Some other Texts produced against free-will in man.*
7. *The first Text reconciled.*
8. *The second Objection removed.*
9. *Arguments deduced from faith. An answer to the said Arguments.*
10. *The first Argument drawn from Scripture to prove man's free-will to good and evil.*
11. *A second Argument proving the same.*
12. *A third Argument.*
13. *Many other Texts inferring the same.*
14. *Texts proving a remnant of good in man.*
15. *Texts proving that a natural man cannot do a theologick good act through himself, and being only assisted with the ordinary concurs of God.*
16. *Scriptures inferring, that a supernatural man hath no free-will to direct contraries, that is, to do theologick good and evil. An answer to some Texts produced by Bellarmin.*
17. *Scripture proofs concluding, that the means, whereby God's extraordinary concurrence is procured, is in man, and adheres to his free-will.*
18. *Whether man's actions performed with God's extraordinary assistance are to be taken for the actions of God, or of man.*
19. *A reconciliation of the ninth to the Romans. The unfolding of Predestination, or of God's eternal Decree.*

I. **T**He precedent Dispute touching Free-will, is not so much held among natural men, as between them, who conceive themselves to be gifted. As for the first, I have already endeavoured

endeavoured to satisfie them. And as for these last, they alledging sacred Texts for their opinions, plead with more force than the former: Wherefore it will not be amisse to examine their Arguments, and afterwards to produce such others, as most orthodox Divines do urge for the proof of their tenents.

The first Scripture, which they seem to produce against us, is that in the Prov. 16. 9. *A mans heart deviseth his way; but the Lord directeth his steps.* And in Chap. 21. 1. *The Kings heart is in the hand of the Lord, as the Rivers of water: he turneth it whithersoever he will.* And in the next fore-going Chapter, vers. 24. *Mans goings are of the Lord; how can a man then understand his own way?*

Jer. 10. 23. *O Lord, I know that the way of man is not in himself, it is not in man that walketh to direct his steps.*

Phil. 2. 13. *For it is God, which worketh in you both to will and to do, of his good pleasure.*

II. In answer to these, I confesse, they are most undoubted truths; but they are so farre from making against us, that they prove part of what I stated in the fore-going Chapter. Without God, we cannot act, will, or live: that is, through our selves alone, and without God's ordinary concurrence with us: so that Solomon saith well, *That man may devise his way*, that is, God hath given man a power of Acting, *But the Lord directeth his steps*; that is, he hath not given man so absolute a power, but that he needs God's ordinary concurrence. So St Paul: *God worketh in you both to will and to do*: that is, hath given us a will and an essence, through which we do act; and God doth conserve us in that will and essence; for without his continual influence we cannot abide in our being, or actions. But that, which they ought to prove, is, that God's concurrence with man in his actions taketh away his free-will.

III. They may also oppose against the 1. subconclus. of the 1. conclus. in the ninth Chapter, to wit, that moral good is absolutely evil. Rom. 8. 7. *Because the carnal mind is enmity against God, &c.* But moral good is effected by them, who are carnally minded: Therefore it is enmity against God, that is absolutely evil.

Rom. 14. 23. *For whatsoever is not of faith, is sin: But moral good is not of faith. Ergo, It is a sin or evil.*

Matth. 15. 9. *But in vain do they worship me, teaching for Do-*

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Enriches the commandments of men. But moral good acts are onely such, as the Doctrine of man teacheth: Therefore they are in vain, and evil.

I V. I answer to the first, and except against the *Major*, which is, What ever proceeds from a carnal mind is absolutely evil. I distinguish, that evil is two-fold: 1. Evil in particular (*Malum in particulari*) which is effected from an evil individual, or particular man. 2. Evil in common (*Malum in communi*) or absolute evil, which is evil in itself, and is evil if performed by any man, whether good or evil. Take my Solution thus: What ever proceeds from a carnal minded man, is evil in particular relatively, as it proceeds from him, because it is from an evil man in particular: But this evil in particular doth not make that evil in common, that is, evil to all. For example: eating and drinking in an evil man, or what ever an evil man doth is evil: but because eating and drinking is evil in an evil man, it doth not follow that eating and drinking is evil to all, so as to extend also to good men; now, eating and drinking, and what ever an evil man doth, is evil, because he eats and drinks unworthily and ungratefully, in not acknowledging God to be the Creator of the food, which is set before him, and in not returning thanks for it, *1 Thes. 5. 18.* So that I say, whatever an evil man doth is evil, because he doth it unworthily. Hence I may deny the *Minor*, and say, That a moral good act, which is effected by an evil man, is evil in particular, neverthelesse it abides moral good, that is, good in common, *Tit. 1. 15.* Wherefore this concludes nothing against my assertion; *viz.* That a natural man can do a moral good act; that is, if he be a good natural or moral man: for it is possible to a natural man to be good and evil, and yet be natural.

V. Asto the second, I deny the *Minor*: Because moral good in a good natural man is of faith, yet not of entire faith: for he believeth that God gave him his being, and power of acting: He believeth in God, that he will supply him in all defects. Of this more elsewhere. So that the *Major* is most true: for whatever is not of faith, is sin. All our actions must be good, that is, such as God doth require from us: But if we do not believe God or believe in him, we cannot perform such actions, as are pleasing to him: for in not believing him is to rob God of all his Attributes, of his Mercy, Goodnesse, Power, &c. therein they make
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God a liar; and no wonder then, if men's actions are evil in God's sight, when they perform them without faith.

The last Objection doth require little else for answer, than what was made to the first.

VI. Further, there are other Texts offer'd, arguing that man hath no free-will to do good or evil. That he hath no free-will to do good is proved by the 6th Chapter of *Gen. 5. vers.* *And God saw that the wickedness of man was great in the earth, and that every imagination of the thoughts of his heart was only evil continually.*

Gen. 8. 21. For the imagination of mans heart is evil from his youth.

Rom. 7. 18. For I know that in me dwelleth no good thing.

Job 15. 16. How much more abominable and filthy is man, which drinketh iniquity like water, 1 *Cor. 6. 16. Eccles. 7. 20.* Hence they conclude, that man doth alwayes act evil, and consequently hath no free-will to good.

VII. I answer, that these Texts do not imply man in general, that is, all men, but only wicked men, or the most part of men. I prove it. Were all men implied by these Texts, then there never were any good-men: but there were many good men then, as *Moses, Abraham, &c.* Therefore all men are not implied by the said Texts.

2. And particularly to the first Text: I say, that there were many men (but they were not natural: for had they been natural they could not have been so perverse as quite to have forgotten God and to have denied him) who were preternaturally evil: that is, confirmd Atheists, who plainly deny'd God's Essence, or Existence. No doubt these cannot doe a good act, or think a good thought; because they act and think with an entire and absolute unbelief: Wherefore it is a certain moral saying, that none can do good without faith.

Again, That man hath no free-will to evil, is inferred by that Scripture of the 7th to the Romans: *For the good, that I would do, I do not; but the evil, which I would not, that I do.*

Jer. 13. 23. Can the Ethiopian change his skin, or the Leopard his spots? then may ye also do good, that are accustomed to do evil.

Hence they infer, that a man acteth evil necessarily. In the

first place, the Question is not of an evil action, but of a free-will to will good and evil: Wherefore the first quotation makes for us: That a man doth will good, although he doth not alwayes act it: for saith he, *The good, which I would do, I do not.* Here the Apostle speaks of himself, as he is a natural man, for as otherwise no question he could will good and do good. If as a natural man, then a natural man can will good, although he doth not act that good, which he willeth; the Reason hereof the Apostle doth immediately after expresse in these words; *I find then a law, that when I would do good, evil is present with me; and a little after: But I see another law in my members, warring against the law of my mind, &c.* Which amounts to this; that man in a natural state hath a free-will to good and evil, yet much more to evil; because the will is moved by a two-fold principle. 1. By it self, when it doth represent a certain object to it self without being moved by the inclination of the body. 2. By the inclination of the body, which is a strong appetite, which men are subjected unto through the forcible propensities of their body's: Yea oftentimes this proveth so strong, that it easily bendeth the will to its aim. Now, when the will is moved through it self without being incited by the appetite of the body, it doth and can do good, and leave it.

VIII. The second Scripture proveth the impossibility of Good in Atheists, or in any without the ordinary concursus of God.

IX. There may be farther urged, That a natural man naturally hath no faith, and consequently cannot do a good act. *Rom. 10. 17. So then, faith cometh by hearing, and hearing by the word of God:* Wherefore a natural man cannot believe, because he doth not hear the word of God.

I answer, That the Apostle speaks of the extraordinary means of faith, and not of the ordinary. A natural man then believeth naturally, or by ordinary means. Or thus, The word of God is either written, or imprinted in men's hearts: I say then, that in the first sense faith doth come by attending and hearkning to the word of God, which is imprinted in all men's hearts, except in Atheists, in whose hearts the Law of God is quite blotted out.

Phil. 1. 29. For unto you it is given in the behalf of Christ,

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not onely to believe on him, &c. Ergo, Faith is not natural.

I answer, That faith through Christ is given, and is supernatural; but faith, whereby we believe there is a God, and that he is mercifull, and therefore will find a means to save us, is natural: Although we cannot actually know or believe the assigned means, whereby he will save us. Wherefore there is onely a partial faith in natural men, and not a compleat and entire faith: for they cannot believe naturally in Christ, unlesse it be given to them from God, as the Text doth evidently expresse. Many more are produced: as that of *Acts* 16. 14. *Rom.* 10. 9. *Heb.* 12. 2. All which may be easily answered from what hath been explained just now.

XI. It is time, that I should prepare to defend my own Possitions with the same force, as was used by them of the contrary opinion. That there is a free-will of doing good and evil in natural men, I prove by the *1 Cor.* 7. 37. *Nevertheless he, that standfast in his heart having no necessity, but hath power over his own will, and hath decreed so in his heart, that he will keep his virgin, doth well.* First, the Apostle teacheth that a man doth not act necessarily (*having no necessity*) but contingently, that is, voluntarily. Secondly, That he hath a free will: What is to have a power over his will else, but to enjoy a freedom of will; and that either in acting or not acting; and not only so, but in acting good or evil, and *quoad Specificationem actus*: as expressly in keeping of his virgin, which is a good act.

XI. *Acts* 5. 4. *Whiles it remained, was it not thine own? and after it was sold, was it not in thine own power?* Here is particularly implied a free-will of doing evil or good. Either *Ananias* might have given the whole price of the possession, or part. In choosing to give a part under pretext of the whole, he chose evil: or otherwise he might have chosen to give the whole, and so might have chose good; for it was in his own power, as the Text holds forth.

XII. *Deut.* 30. 11. *For this commandment, which I command thee this day, is not hidden from thee, neither is it farre off. It is not in Heaven, nor beyond the Seas, that thou shouldest say, who shall go up for us to Heaven, and bring it to us? or, Who shall go beyond the Seas for us, and bring it unto us, that we may hear and do it? But (saith Moses) the Word is very nigh unto thee, in thy*

mouth, and in thy heart, that thou mayest do it. What is more plain, then that hereby is intended a free-will, which a man hath of doing good or evil.

XIII. Prov. 6. 5. Deliver thy self as a Roe from the hand of the hunter, and as a bird from the hand of a fowler. This holds forth, that a man can deliver himself from evil, yet not without God's concursus.

Psal. 94. 8. Understand ye brutish among the people: and ye fools, when will ye be wise? Ergo, A natural man hath a power of understanding, if he will; or else may refuse it. Or an ignorant man hath a will of being wiser and knowing; or of rejecting wisdom and knowledge.

Matth. 23. 37. How often would I have gathered thy children together, even as a Hen gathereth her chickens under her wings, and ye would not: Ergo, Man had a will of coming to God: for other wayes God would have called upon them in vain, which is impossible. The same may be inferred from Prov. 1. 24. Isa. 1. 19. If ye be willing and obedient; ye shall eat the good of the Land, but if ye refuse and rebell, &c. Ergo, Man can will and refuse. Rev. 3. 20. Isa. 65. 12. Eccles. 15. 14. Zech. 1. &c.

XIV. The next thing, I come to prove, is, that man hath a spark or remnant of good in him. Rom. 2. 14. For when the Gentiles, which have not the Law, do by nature the things contained in the Law: these having not the Law are a Law to themselves. Which sheweth the work of the Law written in their hearts, their conscience bearing witness, &c. What is here meant by doing by nature the things contained in the Law, but that a man naturally hath a remnant of Good in him (for how could he other wayes do the things of the written Law?) through which he may know the Law, and doth what the Law commands, and hath a conscience bearing witness. This Text makes good my distinction, that there is a two-fold Law, one expressed or written; and the other impressed in mens hearts, or the Law of nature. The same we have also in Ezek. 18. 21. Luc. 13. 5.

Rom. 1. 19, 20, 21. Because that which may be known of God is manifest in them: for God hath shewed it unto them. What can be more clear?

XV. I do farther prove, That a natural man cannot do a Theologicall good act through himself, and being onely assisted with

with the ordinary concursus of God. A theologicall good act is, which doth fully and entirely satisfie and please God. There is also a partial theologicall good act, which differeth from the other in degree, and pleaseth or satisfieth God onely partially: as for instance, Moral good is a partial theologicall good, because it doth incompletely and partially agree with the will of God.

Act. 11. 18. When they heard these things, they held their peace, and glorified God, saying, then hath God also to the Gentiles granted repentance unto life.

2 Cor. 7. 10. For godly sorrow worketh repentance to salvation, not to be repented of, but the sorrow of the world worketh death.

Phil. 1. 6. Being confident of this very thing, that he which hath begun a good work in you, will perform it untill the day of Jesus Christ.

All which allegations testifie, That man, with God's ordinary concursus only, cannot do a theologicall good act. For the first Text declares, *That God granteth repentance unto life to the Gentiles.* The next confirmeth, *That God worketh repentance to salvation.* The last manifestly sheweth, *That God doth begin and continue a good work in us.* By good work is understood a complete and theologicall good work. If then man cannot do a theologicall good act without repentance unto life or salvation, which is through God's extraordinary concurrence, he cannot do a theologicall good act through himself, and by God's ordinary assistance only.

Man being assisted with God's extraordinary concurrence hath a free-will of doing a theologicall good act. *Tit. 3. 8.* This is a faithfull saying, and these things I will that thou affirm constantly, that they, which have believed in God, might be careful to maintain good works. Here it appeareth, that to maintain good works (which good is theologicall good) man must believe in God: and what is it else to believe in God, but to confide and hope in God's extraordinary assistance and concursus. *Ephes. 2. 1.* *Ephes. 1. 3,*

XVI. I remember I asserted in the subconclusion of the first conclusion, in the ninth Chapter, that man, when assisted by God's extraordinary concursus, hath still a free-will, not to ex-

stream

stream contraries; but a free-will of election, that is a freedom of making choice of one good thing before another.

That a supernatural man hath no free-will to extream contraries, that is, to do theologicke evil and theologicke good. I prove it, *Heb.* 6. 16, 17, 18. *1 John* 5. 9, 10. *John* 5. 24. *Ephes.* 1. 13, 14. *2 Cor.* 1. 21, 22. *Rom.* 8. 16. *John* 10. 27, 28, 29. *Matth.* 24. 24. *2 Tim.* 2. 19. *Rom.* 11. 29. *Esay* 42. 3. *Rom.* 8. 1, 38, 39. *Phillip.* 1. 6. The Texts, which are produced by Bellarmin against this position are *Marc.* 4. 15. *Luc.* 8. 13. *John* 15. 2. *Hebr.* 6. 4, 5, 6. *Hebr.* 10. 26. *2 Pet.* 21, 22. All these instances prove only that initiates, hypocrites and superficial Saints have defected, but not that confirmed and truly profound Saints have fallen off and done the worst evil. Besides, them sins or backslidings were not theologicke evils, but moral: so that, had they been confirmed Saints, it would have concluded nothing against us.

A supernatural man (supernatural is, when a man can act supernaturally through the extraordinary concurs of God, that, which a natural man cannot act naturally by the ordinary concurs of God) hath a partial free-will to moral evil and moral good: but he doth moral evil accidentally, and moral good *per se*, and is more inclined to moral good, than to moral evil. Herein doth a supernatural man differ from a natural man, in that the one sinneth with a partial reluctance of his will, and accidentally through the forcible and mighty inclination or drawing of his flesh, *Rom.* 16. 12. the other commits sin *per se* with his whole will, and also with a pleasure. Thus did *David*, *Solomon*, and *Peter* slide back, and committed moral evil; yet it was with a partial reluctance of will, with a fear and trouble, far from doing it with a pleasure or entire will. After the same tenour are these Texts to be interpreted, *Proverbs* 24. 1. *1 John* 1. 8. expressly *Rom.* 1. 32. *Who knowing the judgement of God (that they who commit such things are worthy of death) not onely do the same, but have a pleasure in them that do them.* A supernatural man hath an entire free-will of Election of doing a theological good act: for a supernatural man may pray with faith, praise God with faith, help the poor with faith, &c. All which are theologicke good acts, in choosing of which a man employeth his free-will, *John* 8. 31, 32, 36. *Rom.* 14. 2, 3.

XVII. After this there remaineth still to prove, that the means, whereby God's extraordinary concurrence is procured, is in man himself, and adheres to his free-will. *Zech. 1. 3. Therefore say unto them, thus saith the Lord of Hosts, Turn ye unto me, saith the Lord of Hosts, and I will turn unto you.* Had man not had a free-will and means in himself of procuring Gods assistance, it would have been said in vain: *Turn ye unto me.* But that is impossible. *Ergo*, A man hath a free-will and means in himself of turning unto God. To turn to God is to apply our selves to him, and to beg his extraordinary assistance; and so I prove, that prayer is the first means, whereby we turn to God.

In the first place, turning to God cannot be to believe savingly in him, or to serve God as he requireth: because we of our selves cannot believe savingly, before God doth assist us in an extraordinary manner. Therefore God by commanding us to turn to him; commandeth us to pray to him for his assistance. But this is apparent by other Scriptures, as *Psal. 15. 14. 15. Psal. 55. 23. Deut. 4. 29. Matth. 7. 7. Luke 11. 13. James 1. 5. 1 Pet. 5. 7.*

XVIII. Man being thus inabled by God's extraordinary concursus, the Question will be, Whether the actions, which man so performeth, are to be taken for the actions of God or of man. Divines usually say, *That such actions are wrought from man, but man doth not work them of himself; that is, man doth them actions from himself, but he doth not do them of himself alone, but by God's extraordinary assistance to him.* Wherefore the actions thus effected from man are rather to be called the actions of man, than the actions of God; because man is the neerest efficient of them actions. The sacred Texts appear to hold forth the same. *Mat. 5. 16. Let your light so shine before men, that they may see your good works, and glorifie your Father which is in Heaven.* Here you may observe, that good works, or actions effected from good men, are called mans good works, and not Gods.

The like expression you have in *1 John 3. 3. 10. Good actions are wrought from man, but not of man. 2 Cor. 3. 5. Not that we are sufficient of ourselves to think any thing as of our selves; but our sufficiency is of God:* The Apostle saith here, *That our sufficiency is of God; that is, our power of acting is of God. Gal. 2. 20. Rom. 9. 16. So then, it is not of him that willeth, nor*

him that runneth, but of God that sheweth mercy. Wherefore man cannot will or do a theological good act of himself (although he may from himself) but of God.

XIX. Before I leave this controversie, it is requisite to examine that Scripture of the ninth to the Romans, which seemeth to evert most of what hath been posed in this Chapter, vers. 13, 14, 15, 16. As it is written, *Jacob have I loved, but Esau have I hated. What shall we say then? is there unrighteousnesse with God? God forbid. For he saith to Moses, I will have mercy, on whom I will have mercy, and I will have compassion, on whom I will have compassion. So then it is not of him that willeth, nor of him that runneth, but of God that sheweth mercy.*

1. Hence they may argue. If God hated *Esau*, then he hated also all his actions, and consequently hated his prayers: Wherefore there was no means left in *Esau*, whereby to procure God's extraordinary concourse. Ergo, All men have not the means in them; whereby, &c. This also proveth, that *Esau* had no spark of good in him, and therefore God did totally hate him; for had he had any good in him, God could not have hated that good.

2. *Jacob have I loved.* Ergo, *Jacob* had never any evil in him: for had he had evil in him God could not have loved him.

3. The Scripture makes enquiry, Whether it is unrighteousnesse with God to hate *Esau* and love *Jacob*. Ergo, It is not severe, that God should hate one, and love another; to damn one justly, and to save another *Gratis vel ex gratia*.

4. *Moses saith, that God will have mercy on whom he will have mercy, and whom he will he hardneth.* Ergo, Man hath no free-will to do good.

In answer to the first inference, I deny the sequel. For it doth not follow, that God, because *Esau* had no good in him, or means to procure God's favour, hated *Esau*; but God hated *Esau* for not using the means, which was in him. Rom. 2. 15. Here may be urged that God hated *Esau* from all eternity. Ergo, *Esau* could never have had the means to salvation. I deny the consequence. God hated *Esau* from all eternity, because he fore-knew his actions and intents from all eternity. Here may be demanded, How God can fore-know mans actions, since they are contingent; were

were they necessary, he might. Let the scripture answer you in this *Rom. 9. 20.* We are not to dive into God's manner of working farther, than he hath revealed to us, and nevertheless we must believe, that all things are possible to God, and that he is *Elohim*, Heb. 1. 3. *Luc. 1. 37.* *Phil. 3. 21.* *2 Chron. 20. 5.* *Matth. 19. 26.* *Esay 9. 6.* *Jer. 32. 18.* *Gen. 17. 1. & 35. 11.* *Ruth 1. 20, 21.* *2 Cor. 6. 18.* *Revel. 1. 8. & 4. 8.* *1 Tim. 6. 9.* Neither is it a legal inference, that because God hated *Esau*; therefore *Esau* had no remnant of good in him: he might have had good in him, and yet God have hated him; not for having that good, but for not exercising it. God might also have hated *Esau* from all eternity for his sins and evil actions, which God foresaw from all eternity; and yet he might have had a principle of Good in him.

As for the second Argumentation, I deny the consequence: for it doth not follow that *Jacob* had never no evil in him, because God did love him: for God loved *David*, and yet it is apparent enough, that *David* had evil in him, *Rom. 7. 24.* *Paul* calleth himself wretched; yet it is certain, that God loved him. God pardoneth their sins, because they are committed by them, not with an entire will, but with a reluctancy, *Romans 7. 20, 23.*

To the third I answer: It is no severity in God to love one and hate the other, supposing that God can fore-know all man's evil actions; and therefore hateth him. He may also fore-know his good actions, and come to love him from all eternity: yet not because his actions are absolutely good in themselves, *Luc. 17. 10.* *Rom. 11. 35, 36.* *1 John 1. 8.* *Esay 64. 6.* *Psal. 130. 3.* but because God out of his grace and mercy doth impute his actions to him for righteousness, *Rom. 4. 21, 22, 23, 24.* *Ephes. 2. 8, 9.* *Phil. 3. 9.* *Col. 3. 24.* *2 Tim. 1. 16.* But it would be severe should God hate us from all eternity, if we should falsely suppose that God did not fore-know our actions: so that herein you conclude nothing against me.

If (in the fourth place) God sheweth mercy to those onely, to whom he will, and hardneth their hearts, whose he pleaseth to harden: it will prove in vain to man to work good works, or to will good, neither can he will or do good without God's grace and mercy. All this I grant to be a certain truth, that we can do

no good work without God's grace and mercy : and no doubt but God hath also a free-will to conferre grace and mercy on whom he pleaseth, and harden those whom he pleaseth to harden, *working all things according to the counsel of his own will*, Ephes. 1. 5, 6, 11. Revel. 4. 11. Psal. 135. 6. Psal. 33. 9. Matth. 8. 2, 3. Neverthelesse this is no ground, why we should argue, that man hath no free-will, because God hath a free-will : we rather ought to surmise the contrary ; That man hath a free-will, because God hath a free-will, Gen. 1. 26. *God doth work in us to will and to do of his good pleasure or will*, Phil. 2. 13. Ergo, God's will doth not abolish our wils : but his will is, that we should have a will. But possibly you do farther urge this argument by subducting Predestination from thence, thus : If man is predestinated, Ergo, He hath no free-will of doing good ; for a free-will in him would be in vain. This Text doth apparently teach God's eternal Decree, Predestination or Ordination to save some, and damn others : But for what ? for to manifest his Glory, Mercy and Justice, Acts 13. 48. *And as many as were ordained to eternal life, believed*, Isa. 46. 10. Mal. 3. 6. Hereunto I answer, that God's Predestination is in no wise coactive ; for, were it so, then Predestination and Fate of the *Stoicks* would not differ : What is fate, but an irresistible and forced impulse upon man, through which he doth necessarily and unavoidably perform all his actions, and especially such, which concern his life and death, his ruine or advancement in politick affairs, his marriage, or any other extraordinary change of life ; for in all these fate was most taken notice of, and therefore more particularly attributed to them cases ; Although fate in general denoted an unchangeable and necessary ordination upon all beings. Whether this ordination was imposed by *Jupiter* as the Poets feigned, or caused from a necessary bending and disposing of the Heavens, and its constellations, as the *Chaldeans* thought, doth not much concern us in this Treatise.

Cicero was not a little puzzeld in expounding, how free-will might be allowed : and yet not be repugnant to Gods fore-knowledge ; for thought he, doth God fore-know our actions, then man must act necessarily, and consequently infers the truth of *Fate* ; but since he could not grant a Fate over men, because he saw they acted contingently, therefore he did impiously rob God of

of his fore-knowledge. Hence saith *Austin. de Civ. D. Lib. 5. cap. 9. Atque ita, dum vult facere liberos, fecit sacrilegos*, and so since he endeavoureth to make men free-willers, he makes them commit sacrilege. As for this doubt, it is little touched upon by Christians, who certainly know, that God fore-knoweth contingent things, as contingent, and to fall out contingently: Necessary things as necessary, and to fall out necessarily, *Psalms 33. 14. 1 Sam. 10. 9, 26. Prov. 21. 1. Exod. 12. 13. Prov. 16. 33. Matth. 10.* This subject is very well treated of by *Anselmus* in his Book of God's fore-knowledge and predestination. This by the way. And now I return to prove, that God's Predestination is in no wise coercive upon the will of man: for then the will of man would be a not willing, *Voluntas esset noluntas*. God is most just in predestinating man through Election, and of his grace and mercy to salvation, *Eph 1. 5, 6.* and in predestinating others through reprobation, and of his justice, to damnation, *2 Cor. 13. 5.* Because his predestination is founded upon his fore-knowledge: God therefore fore-knowing the evil, wherein man is enhardened, doth predestinate him to damnation. This I prove. God damneth man of his justice, and God's justice hath a particular respect to man's evil actions. Wherefore it is of God's justice, and for man's sinne, or evil actions, that he is damned. That God's justice hath a particular respect to judge and punish man with damnation for his sins, the Scripture doth evidently testifie, *Luc. 12. 47, 48. And that servant, which knew his Lords will, and prepared not himself, neither did according to his will, shall be beaten with many stripes. Ergo,* Man is punished for not doing the Lord's will: and not because he was predestinated without God's fore-knowledge of his evil and unbelief, *Matth. 11. 21. Mat. 25. 41, 42.* Here Christ pronounceth the sentence of everlasting damnation against the wicked, because they had not done his will in feeding the hungry, and cloathing the naked, *Gen. 2. 17. Deut. 7. 26. Exod. 32. 33.*

So then, if God doth damn man onely for his trespasses and sinnes, he doth also for the same reason predestinate him to damnation.

Again, Were God's predestination the sole and first moving cause of mans reprobation, then *Adam* could have had no free-will of remainig in the state of innocency, or of defecting to the

state of sinne, but must necessarily and coactively have deflected to the state of depravation, because God had predestinate him to it: This assertion is impious: *Ergo*, God's predestination is not the first moving cause of man's reprobation. What? should God predestinate man to damnation without fore-knowing his guilt, or without being thereunto moved through the fore-knowledge of his sinne, then these Texts would be written to no purpose. *Hos.* 6. 6. *Ephes.* 4. 22, 23, 24, &c. *John* 3. 16, 17, 18. *John* 3. 36. *Rom.* 9. 22, 23. *Ezek.* 33. 11. *As I live, saith the Lord God, I have no pleasure in the death of the wicked, but that the wicked turn from his way and live: Turn ye, turn ye from your evil wayes; for why will ye die, O house of Israel? Wherefore it is not of God's purpose to damn any, unlesse being moved to it of his justice through their unbelief.*

Likewise the Scripture doth reveal, that predestination to life eternal is of God's grace and justice, being thereunto moved by the faith of the righteous, *Mat.* 9. 22. *Rom.* 4. 20, 21. *Ephes.* 3. 12. *Mat.* 9. 2. *Gal.* 2. 20. *Ephes.* 2. 8, 9.

First, Summarily I say, that God's Will, Decree, and Predestination, is the efficient cause of Reprobation and Election: his grace, mercy and justice, are the moving causes: Man's unbelief and belief are the objects of this motion, in which, or upon which, and by which the fore-mentioned moving causes are moved: which objects God fore-knowing determinates mans salvation or damnation from all eternity: Wherefore we may observe, that in many places of Scripture, where predestination is held forth, that God's fore-knowledge of mans belief or unbelief doth precede. *Rom.* 8. 29. *For whom he did fore-know he also predestinated to be conformed to the image of his Son.* What can be more evident?

Secondly, Faith or good works (for faith it self is the best of works, and the fountain of all good works) are the means, whereby we are saved; yet it is not faith or good works, which do meritoriously or efficiently save us, but God is the efficient cause of our salvation. *Rom.* 4. 6. So likewise unbelief (which is the worst of works, and the original of all evil works and sins) or Atheism is the means, through which we are damned: yet it is not that, which is the principal moving cause of our damnation, but God's justice, which doth reject and predestinate man to damnation. *Rom.* 4. 8.

Thirdly

Thirdly, God's will is either absolute, whereby he can will all things; and this is concomitant to Gods absolute power, whereby he can do all things, although they never are effected; for if he can do them, he hath also a power of willing them, although he doth not will all them things, which he can will: or his ordained will, whereby he willeth that, which he doth will. This ordained will is unchangeable: hence *God* is said to have loved, because he loved: that is, when God willeth to love, he cannot but love, because he willeth it; and therefore his will is unchangeable. God's ordained will is, that man shall be saved through his belief: and therefore cannot but save a believer, because his will endureth for ever, and is unchangeable. Wherefore I said in the first Assertion, That man's belief moved God's mercy: because God hath willed it through his ordained will; otherwise were it not for this, what could man's belief avail in meriting salvation? for at the best, *we are but unprofitable servants*, Luc. 17. 10. and so man's unbelief moveth God's justice to damne him, because God willeth justice. Wherefore I conceive that belief and unbelief are remote moving causes, as from us, by which we move God's mercy and justice: And that God's mercy and justice are moving causes from himself.

Fourthly, Man hath then a power of disposing and preparing himself partially to, and for the admission of God's extraordinary concurs, and to a conversion from the state of sinne to the state of grace; for to what effect or end would all the teachings of Ministers serve? All their exhortations, their labour and pains would be to no purpose.

1. They strive to bend men into a care for their salvation, by working that carnal security out of them, according to that of *Acts 2. 37. & 16. 33.*

2. They lay the Law of God open to men, in quickning the print of it in their hearts, which was almost deaded, and exhorting them to examine the course of their lives, *James 1. 23, 24, 25.*

3. The immediate effect of this search is the conviction of a mans conscience, *Rom. 1. 20. & 2. 1. Rom. 11. 32.*

4. This conviction of conscience bringeth them to a desperation of their salvation, they finding that emptinesse and unability in themselves, *Rom. 7. 9, 11, 13.*

5. This

5. This begetteth a humiliation in their hearts, grieving for their sins, fearing the guilt, and dreading the punishment; and so they are brought to a confession of their sins, *Mat. 9. 12.*

All these effects are produced through the insight of man into his own heart, where all men contain the moral Law, and may through the light of Nature, and God's ordinary Grace, or ordinary Call unfold it in the same sense, which the quoted Texts do expresse.

CHAP. XI.

Of the Command of the Will.

1. *Whether the Will can be forced.*
2. *What elicited and imperated acts are.*
3. *What command the Will exerciseth over the inferiour faculties. What a politick and despotick command is.*
4. *That the irascible and appetitive faculty are under a politick obedience to the Will.*
5. *That the locomotive faculty is not alwayes under a servile obedience to the will.*
6. *That the Will doth not command over the practick understanding.*

I Have digressed somewhat beyond my bounds in the last Chapter, in alledging Scripture to prove many fundamental assertions of this Treatise; the which although I ought to have performed by reason onely, nevertheless to gratifie some (whose education teacheth them not to give credit to any reason, unlesse confirmed by Scripture) I contracted the fore-mentioned quotations in one little space. And now to keep on my road: There remains one Question more relating to the freedome of will, which I shall first endeavour to answer, and then go on in adding what is requisite. The Question is, Whether the will can be forced. This is a strange kind of doubt, Whether the will,

will, when it doth not will (for when it is forced, it doth act against its will) be a will: However this seemeth an absurd query, if understood in so many plain words; yet supposing that act to be forced or against the will, which is willed through the will, but with a reluctancy, and fore-knowledge of inconvenience thereon ensuing; the Question may be conceived in a safe meaning.

The will is termed forced, when it doth will through compulsion or impulsion, or through a positive or privative violence (as others explain it) without which it would not have willed that, which otherways it willed. The Question might rather be proposed thus; Whether the will, when it is forced, is free, or acteth freely: for no doubt the will of man can be forced in all her acts, whatever Authors say to the contrary. I prove it. Man can be forced in his *imperated acts*. Ergo, A man can also be forced in his elicited acts, because there is no imperated act, but it derives from an elicited act; for it is the elicited act, which commandeth the other act.

Here may then be enquired, Wherein a forced elicited act differeth from an absolute free act. I answer, That both these acts proceed from the will with a consent; but that, which the will acteth with an absolute freedom, it acteth without any remorse, and with an entire consent: That, which she will acteth, when she is forced, she acts with a remorse and partial reluctancy, for to avoid a greater inconvenience or evil; and were it not for that, she would not have acted it.

The will cannot properly be said to be forced through a privative violence, because the will doth not act at all, when she is hindred.

II. The acts of the will, according to Moralists, are either elicited, or imperated. An elicited act of the will is, when she doth act within her self, by proposing the goodnesse of an object, and consenteth to the covering or rejecting of it. The imperated act of the will is, whereby she doth execute that, which she had concluded and agreed to by the elicited act, in commanding the inferiour faculties.

III. The command, which the will exerciseth over the obeying faculties, is politick, or controlable: The obeying faculties are the internal and external senses, the locomotive faculty, the

irascible and appetible faculty. I prove it. The internal senses obey the will from a politick obedience; for a man willeth oftentimes not to think, or to remember this or that thing, which nevertheless doth force into his mind: Besides, the phantasie worketh in a dream without being commanded by the will: Wherefore the wills command is not despotick, but politick.

The external senses do not obey the will from a despotick obedience, because the will frequently cannot *per se* hinder them in their functions: as for instance, she cannot at all times hinder the hearing from perceiving a noise, or the scent from smelling a bad sent, &c.

I V. The irascible and appetitive faculty obey the will politickly, because our natures are oftentimes prone to envy, anger, or revenge, when we would not be so. So our natures* are as oft propense to covet evil objects, which our will doth contradict.

* Not as we are like unto men, but rather unto beasts.

V. The locomotive faculty doth frequently refuse a servil obedience to the will; for in wearinesses and convulsions she is rebellious and unable: Besides, the locomotive faculty being in some cases more obedient to the sensitive appetite, she obeyeth it, before she obeyeth the will. Lastly, The locomotive faculty is oftentimes at work in a dream, and at other times, when the will doth not command her; and thence it is evident, that the locomotive faculty doth not obey the will from a despotick obedience.

VI. It is absurd to affirm, That the will commandeth the practick understanding; for it is the same thing, as if you said, That the will commanded her self, the will and practick understanding being one and the same.

CHAP. XII.

Of Voluntary and Involuntary.

1. *That the Understanding, as it is Speculative and practick, is the internal principle of the ultimate and intermediate actions. That God or Angels are improperly said to be external principles. That God is the coefficient of man's actions. How Angels, whether good or evil, Wizards and Witches concur to the specification of man's actions.*
2. *What a humane action is.*
3. *That it is absurd to assert man to do a thing ignorantly.*
4. *Whether evils of omission through ignorance are to be termed involuntary.*
5. *How humane actions are divided.*

1. **H**itherto we have declared the internal principle of man (namely the understanding, as it is speculative and practick) through which he acteth in order to the attaining the *Summum Bonum*, and arriving to his last and ultimate action, the immediate fruits of which is the greatest happinesse. Furthermore, we are not only to state the understanding to be the internal principle of our last and ultimate action, but also of all intermediate actions, and of such as are called humane, moral, or voluntary actions. We need not augment the number of internal principles, by adding Habits to them, these being supposed to alter the foretated principles accidentally only, and not essentially. How Habits are acquired, and how intended, remitted, and corrupted, we have set down elsewhere. Neither are God or Angels properly said to be external principles, since all principles strictly are required to be internal. But God may be justly termed the coefficient of the actions of man, since God *worketh in us to will and to do*. Angels, whether good or evil, Wizards and Witches cannot concur efficiently to the effecting of humane actions, to which an infinite power is onely sufficient, whereas they, consisting of a limited power, are therefore rendered

der'd uncapable. They may concur to the specification of an act, as persuasive causes in bending man's will to this or that act, by changing the phantasie, in stirring up the humours and spirits of the brain, whereby it may represent objects otherwise than they are, or by presenting objects through a false image or representation, or by changing the external sensories. Whence we may observe, that it is not in the Devils power to make or force us to doe a thing against our wills, but that we may discover, resist, and refuse his deceitfull motions; or otherwise we might be justly thought excusable; wherefore, if we do at any time commit evil through the perswasion of an evil spirit, we must not onely accuse the wicked spirit, but our selves also.

After our discourse upon the will, there remains alone to appose a word or two touching humane actions.

II. Humane actions, otherwise called moral and voluntary, are such, as are effected by man, as farre as he is a man, or are produced by his will, or practick understanding. Wherefore whatever man acteth with the fore-knowledge and fore-command of his practick understanding is humane and voluntary. A voluntary action may be purely voluntary and free; or mixt out of a *Voluntas*, and *Noluntas*, that is, willed with a reluctancy. The first acception of Voluntary, *Aristotle* terms voluntary strictly so called; the latter he denominates involuntary; but improperly.

III. It is absurd to assert man to do a thing ignorantly, since it is impossible for a man to do any thing, which he doth not fore-know. Wherefore it must be an errour in the *Peripateticks* to affirm, that man can act an *involuntarium quiddam ex ignorantia*, because he acteth nothing, but what is consented unto partially, or totally by his will, which cannot will any thing (as the *Peripatetick* definition holds forth) without the fore-knowledge of the understanding. Hence I conclude, that nothing is to be termed involuntary or mixtly voluntary, unlesse a man is forced to it violently, or by a cause acting from without.

IV. Here may be demanded, Whether evils of omission of duties (required by a Law) committed by man, when he is ignorant of the said Law, are to be termed involuntary? No certainly, for they are voluntary, in that the omission of an act is

as much an act of the will as the effect of it. But whether such omissions or commissions, which a man doth will, are to be termed evil, in regard he willed them through ignorance, which had he not been ignorant of he would not have willed, is to be decided from the circumstances of such actions, and not from the imputing such actions not to be the actions of man, or not to be voluntary. Moreover I answer, That no kind of ignorance doth make an action neutral (that is, neither good or evil) and excusable, but an invincible ignorance. What invincible ignorance and other kinds of ignorances are, I do wittingly omit the inserting, since they are vulgarly enough known. As for such circumstances, which are required to render humane actions good or evil, I have set down in the latter end of this Book.

V. The action of the will is accidentally divided in fruition and intention. Fruition is the continued coveting and willing of an object, already before coveted and now enjoyed. Intention is a mediate coveting of means, whereby to covet an object immediately, or to arrive to the fruition of it. Intention contains in it three inferiour actions. 1. Election, whereby the practick understanding doth by a preceding deliberation covet one or more objects for a means out of many. 2. Consent, which is a further coveting of that or them objects, which it hath elected, so as to be confirmed and pleased in that election. 3. *Ufus*, or *Ufance*, otherwise called execution, which is the application of the means, now elected and consented unto, to a further action.

CHAP. XIII.

Of Natural Faith:

1. *That Faith is the sole means, through which we are to attain to our greatest good. What Faith is. The Definition confirmed by Arguments deduced from reason.*
2. *The two-fold object of Faith. A proof from reason, that*

- God is the Creator of man. That God and Nature are one.
3. An enquiry into the end of man's creation.
 4. That man doth know the summe of God's Law through the light of Nature. A summary enumeration of the Law of God, as it is imprinted upon every man's heart.
 5. Moral virtues compared with the moral Law. A comprehension of all moral virtues.

I Have just now finisht my Discourse upon the subject of this Tract; that, which falls next under our consideration, is the means, through which we are to attain to our greatest Good and happinesse. The sole means is Faith.

Faith is a certain knowledge of God and the Law, and an assurance in, and of God's mercy and goodnesse. The *genus proximum*, and *differentia proxima*, are signals, that their *Definitum*, or thing defined is not an historical or temporary faith, or faith of miracles onely, but a justifying and glorifying faith, necessarily comprehending in it self the three other kinds, as degrees, by which the soul doth gradually ascend to an exalting faith. Among other School-Divines it goeth under the name of an explicite Faith. *Fides* the same with the *Definitum*, deriveth its denomination from *fidere*, a word not in use among the later Latinists, whose signification the verb *confidere* hath since supplied, which is to rest contented and fully satisfied: Wherefore assurance implying a certain practical knowledge freed from all doubts, and causing this rest and satisfaction, doth justly and properly deserve the place of the *Genus* in this Definition.

The certainty, which Faith doth bring with it, depends upon the certainty and necessity of its premises, which being necessary and certain infers a certain and necessary conclusion.

If God is mercifull, he will save them, that beg mercy.

But God is mercifull, and I do beg mercy.

Therefore God will save me.

This Conclusion, as depending upon unchangeable and certain premises, holds forth, that Faith is an undoubted assurance of God's mercy, and that he will save a zealous believer. No wonder then, if Faith doth create this quietnesse, rest, and satisfaction.

Austin.

Anst. de Civit. Dei, lib. 19. cap. 18. tels us no lesse : To the Academicks all things are uncertain : but the City of God doth quite detest such kind of doubting, like madnesse : having a most certain knowledge of them things, which it comprehendeth in its mind and reason.

II. The object, about which Faith is conversant, is double : 1. God, and the Law. 2. God's infinite mercy and transcendent goodnesse. This duplicity is necessary ; because, first, we must know our present state : Secondly, how to get out of that state into a better. Our present state is made known unto us through knowing God and the Law. The way, whereby to change this state for a better, is through an assurance in God's mercy and goodnesse.

A natural man, after having made enquiry, what he is, and finding, that he is a man, a Rational living creature, above all other creatures in the world, and of a most excellent and admirable essence, cannot but straight way admire and search from who, or whence, he had thus noble being. Certain'y although if he hath never heard of God, or attained to the knowledge of him, yet his reason will direct him to observe daily experience, which sheweth him, that every man descends from his parents, and they from their progenitours ; or that man is continued by propagation : By the same rule of experience he is also instructed, that all things in the world are finite, and have a beginning and ending : If so, then there must be one first cause, from which all Beings derive their Essence : This cause is an universal cause, by reason that all things have received their being from it : If all things are derived from this universal cause, then certainly the race of man had its beginning also thence. Some of the ruder sort may object, that all things are by nature. In answer to this, I demand, what they mean by nature ? they will reply an universal cause, which acteth most uniformly and unchangeably. Secondly, I demand through what principle all things are continued ? They say, through the same nature. Nature, say they, acteth most wisely and most providently, and hath so acted from all eternity. This is so farre from an objection against us, that it is an argument for us : For by these very words they expresse God, who is nature (*Natura naturans*) and the sole universal cause acting most uniformly, unchangeably

(*secundum*)

(*secundum voluntatem ordinatam*) most wisely, providently, from all eternity, and continuating all things from the beginning, untill the ending. Let an Atheist therefore answer never so perversly concerning the first cause of all beings, yet *nolens volens* he doth plainly confesse, that there is a *God*, although under another name of *Nature*.

III. Man knowing, that God hath created him, he cannot but wonder, for what end. For God (thinks he) acteth nothing in vain. He is sure, it is not for to eat, drink, and live; for were it so, God needed not to have conferred a reasoning or understanding faculty upon him, because he could have eaten, drunk and lived without an understanding. The end therefore, for which he was created, must be that, to what his understanding makes him capable. His understanding is capable of knowing God, and his Laws, of praising, serving, obeying God, and living according to his Commandments.

As for his Commandments he will find them written in his heart.

IV. 1. He may easily gather, That there is but one true God, because he is Almighty, and can work all things: If then there were more Gods than one, it supposeth, that they are not almighties, but must work sociably one with the other; or if they are almighties, that, as many as are more than one, are in vain: for one is Almighty, and can do all things; if he can do all things, then there is nothing remaining for the others to do, who must then be in vain. But to imagine otherwise is absurd. *Ergo*, There is but one true God, and all the others are false gods.

2. God is a Spirit, and therefore will only be worshipped in Spirit. This was not unknown to the *Heathens*.

*Si Deus est animus, nobis ut carmina dicunt,
Hic tibi praeipue sit pura mente colendus.*

If God a Spirit be, as most of Poets say,
In purity of mind we must unto him pray.

What a vain thing is it for man to worship an Image? as if God could not perceive or know our worship without that Image; or as if we could not know God without an Image. If we can truly make an Image of God, then God is no Spirit, but an old man, as the Papists picture him.

3. A Lord's servant seldom speaks of him, without naming of him his Lordship, or his Honour, or the Right Honourable, and so doth reverence and homage his very name; and no doubt, but a Lord would conceive himself much provoked, should his servant take his name in vain: much more ought man, who is the meanest servant of the Lord of Lords name his name with all reverence and humility; for God is most highly provoked in hearing of his name taken in vain.

4. There is an ordinary manner of serving God, which ought to continue at all times in doing all things to his glory. God doth permit man to do that, which tends to his conservation; neverthelesse at those times we ought to praise God for giving us strength and means, whereby we are preserved. There is also an extraordinary manner of serving God, when we forbear from all temporal and corporeal actions, and abide wholly in spiritual exercises for a day, a week, or a moneth. Assuredly this is acceptable to God, and therefore we ought to repeat it often.

These are the duties which a man may gather are to be performed to God. But this is not all, there are other duties remaining respecting to ones self and others. Among others, some are particularly related to us, as our parents; some in a common and general relation only, as our neighbours.

5. The Duty, which we owe to our parents, nature teacheth us, as to honour, love and obey them.

6. The Duty to our selves and others is, to do what we can to preserve our selves and our neighbours, not to injure or kill our selves or others: To do to others, as we would have other do to us. We must shun all envy, anger and hatred.

7. A man is not to defile himself or another. Modesty, unchast thoughts, carnal desires, wanton gestures are by the light of nature adjudged evil and sinfull.

8. We ought to render to every one what is his. We are not to wrong our neighbours in his goods, houses, cattel, or corn, &c. We must detest cheating, defrauding, or crafty over-reaching of our neighbours, whether by lies, false measures, else weights, or moneys, and usury, &c.

9. A false oath is unjust and injurious, the like are slanderings, lies and backbitings, the harbouring of bad thoughts of others without a manifest cause.

10. We are not so much as to have the least desire to what is not our own, if it be to the wrong of another, unlesse we desire withall to give full satisfaction and contentment to the owner, which is only possible in unfixt and untied matters.

V. I have briefly enumerated the contents of the Moral Law, according as it is engrafted upon all mens hearts. This Law is perfect and compleat, because there is no moral precept belonging to any moral virtue, but is contained herein, neither is there any vice, but is hereby checked and condemned: Wherefore I shall compare them together, to wit, moral Virtues with the moral Law.

A virtue is a habit of acting good: on the other side, vice is a habit of acting evil.

Virtue or vice may be termed moral or theologicke according to the act, which it produceth, which is either moral good or evil, or theologicke good or evil.

So holinesse is a habit of acting according to the Law of God. Sin is a habit of acting contrary to the Law of God, according it is written in all mens hearts.

That this Law is known to all men, it appears hence, because all men are checked by their conscience at one time or another for their sins.

There are four cardinal or principal Virtues: *Prudence, Justice, Temperance and Fortitude.*

Prudence is a habit, through which a man is directed in exercising particular virtues.

Its integrant parts are three. 1. The remembrance of things past. 2. The knowledge of things present. 3. The fore-sight of things to come. *Thomas Aquinas* counteth eight. 1. Memory. 2. Knowledge. 3. Aptnesse to learn. 4. Cunningnesse. 5. Reason. 6. Fore-sight. 7. Circumspection. 8. Caution.

The subjected parts of *Prudence* are four. 1. Kingly prudence, in governing his Subjects. 2. Politick prudence of the People, in obeying the Magistrate. 3. Oeconomical prudence, in governing a family. 4. Military prudence, in ruling an Army.

The potential parts of prudence are three. 1. Inquiry for means. 2. Judgement concerning the means invented. 3. Com-

3. Command, that them things be effected, upon which judgement is past.

Justice is a virtue of giving every one, what is his.

Its integral parts are three. 1. To live honestly. 2. To give every one what is his. 3. To wrong no man.

The subjected parts of *Justice* are two. 1. General *Justice*, through which a man deals justly with the Commonwealth. 2. Special or particular *Justice*, through which a man deals justly with every particular person. Special *Justice* is two-fold. 1. Commutative *Justice*, through which a man is just in his trading with others. 2. Distributive *Justice*, which is either recompensing every one for his good deserts; or punishing every one for his crimes: in which there is observed a Geometrical proportion: and in commutative *Justice* an Arithmetical proportion.

Right is that, which agreeth with the Law or *Justice*. It is either natural, or positive: humane, or divine: Ecclesiastick, or civil: written, or not written.

A Law is a rule, command, or precept of *Justice* containing in it, what is just, and what ought to be done. There are three conditions required to the constitution of a Law. 1. Equity. 2. Authority. 3. Promulgation, or the publishing of it.

A Law is either external, or participated. The participated Law is divided in Natural, Humane, and Divine.

The Humane Law is either Civil or Canonical.

The Divine Law is divided into the old and new Law.

Temperance is a habit of moderating the senses, particularly the senses of feeling and tasting.

The integral parts are two. 1. Bashfulness. 2. Honesty.

The potential parts are four: Continence, Clemency, Humility and Modesty.

The subjected parts are Abstinence, Sobriety, Chastity, and Shamefastness.

Fortitude is a virtue in attempting terrible matters.

Its acts are two. 1. To uphold. 2. To go on.

The integral parts of *Fortitude* are Magnanimity, Magnificence, Patience and Perseverance.

A man must not only have a bare knowledge of God's Law, or of the moral Virtues, but also a practick knowledge, that is to know them in himself so as to practise them

CHAP. XIV.

Of Man's Fall, and of Atheism.

1. *A rational enquiry into man's primitive estate. The manner of man's fall.*
2. *Grounds, whence a man may rationally collect hopes for his restoration.*
3. *That Atheism is the worst of sins, and that an Atheist is unable of performing the least good act. Wherein the goodnesse of an action doth consist,*
4. *A Character of an Atheist. That confirmed Atheism is the onely sinne against the holy Ghost. A full Discovery of an Atheist.*

THe other part of the object of Faith is Gods mercy and goodnesse: how a natural man comes to find out God's mercy, I shall instantly demonstrate. Man, having compared the difficulty of the Law with his unablennesse of performing obedience to it, cannot rest satisfied or assured, unlesse relieved and assisted by these two Attributes of God: for he, being conscious of his pravity and corrupt state of nature, must imagine, that he was not so created, but good and blessed; because the Creator is good and blessed, and being left to his free-will, knowing what was good, and what might be evil, he through a wanton curiosity and alurement of an evil spirit (which spirits were created before man, and whose nature it hath alwayes been to tempt man and draw him into evil; as shall be proved by reason elsewhere) was overwayed to try evil; one act of which, had not God through his grace prevented it, might have been valid enough to corrupt his nature in such a manner, that he would have been rendred incapable of ever recovering his former state, or of acting a good act; By reason that the commission of one evil act must needs have effected a privation of that habit, which he once had of working good: for they being acts proceeding from two contrary habits, the latter must have expelled the former.

mer, which would have remained unrecoverable; because *à privatione ad habitum non datur regressus*. After a privation a habit cannot return: Put out your sight once, and you will never recover it. Wherefore it must have followed, that man being arrived to this depraved state of nature must have become a meer alien from God, in whose former resemblance his happinesse did consist. Furthermore, the immortal spirit, expiring out of the body in that condition, abideth eternally in absence and dissemblance from God, which two cases makes its state most wofull and dismal. Thus you may remark, that it is possible to a natural man by way of a *Sorites* to collect his first beatitude, deficiency, guilt, and punishment.

II. Is it not then a man's greatest concernment to bestir himself in this need and defect for a means of restoration? Here may be demanded, How can a man hope for restoration, if the habit of acting good is quite extirpated, and that from a privation to a habit, there is no returning? 2. Why may not a man have the same hopes of restoration here in this world, as well as out of it, as the Papists hold?

To the first I answer, That extirpation may be understood in a two-fold representation. 1. As it represents a total extinction and annihilation, *Nihil remanentesui*. 2. As it doth represent not a total, yet almost a total annihilation, there still remaining some part of the thing: thus a man saith his eye is out, when he can see but a little. It is possible for a man to be in either of these conditions: if he is in the first, questionlesse he is in a lost condition, and is incapable of recovery, for the objected reason. The continual acting of evil produceth a total habit of evil; wherein if a man be habituated, that small portion of the remaining good is totally extirpated: As in an Atheist, who is one, wherein the habit of Good is totally extinct, which maketh him affectately and perversly ignorant of God, and in whom the habit of evil is radicated, whereby he becometh a blasphemmer against God in denying his being.

III. An Atheist hath not so much virtue or power in him, as thereby to do one good action. A good action is, which doth resemble its pattern (*Bona censetur actio, quæ sua idea fuerit conformis*) and therefore must, 1. Proceed from a good principle. 2. Be employed about a good object. 3. Be intended to a good

end. A good action here taken in a moral, not physical signification, whose principle and object is right Reason and moral good: Its end is to be agreeing with a good will. So that an Atheist cannot work a good work; his principle of Good (to wit right Reason) being totally depraved and corrupted; for he in denying God denieth his right Reason, when, as I have proved in the Doctrine of Souls, right Reason cannot, but must necessarily retain an impression of God's existence, goodnesse and omnipotence, from whom she received her production: or he in denying God denieth his own being, his being consisting in a resemblance to the Image of God, the perfect pattern of his once perfect essence; which doth argue, that his right Reason is totally extinct, and that there remaineth a plenar possession of corruption and depravation in his understanding and will, through which he judgeth of all things, otherwise than they are. And this is farther evident; because our understanding judgeth of all things in ordination to action, all our actions are performed in ordination to our last end, which being positively denied by him, proveth the truth of the fore-stated Conclusion.

The second Qualification of a good action is, That its object must be good. A mans will is carried forth to a triple object, whereof two have respect to the body, the other to the soul. Of the two respecting the body, one is desired for the conservation of the body, the other for conservation of the *species* or kind. These as being Physical objects are Physically good to all natural Bodies; for *Ens & bonum convertuntur*, a Being and Good are convertible. Wherefore this maxime, *Omnia appetunt Bonum*. All Beings covet good, and cannot covet evil, is onely to be understood of Physical good objects.

The third Object relating to the soul is moral good, whose objectiveness is only proper to rational essences.

The last condition required in a good action is its direction to a good end; which is, to God's glory and praise, to the admiration of his Wisdom, Omnipotence and all others of his Attributes. If we compare the actions of an Atheist with these three qualifications, we shall find them infinitely different, and defective from them, they proceeding from the worst of principles, and being employed about impropportionate and brutish objects, and

and directed to a wicked, malicious, and hellish end, namely to Gods greatest dishonour.

IV. Summarily to give you a Character of an Atheist. An Atheist is a most horrid monster; once a man, now worse than a Brute; a Devil in the shape of a man; ungratefull beyond the expression of a tongue; rigidly injurious to God and man; a sinner beyond the worst of sinners; a fit object for God's vengeance, and the greatest torment, that the depth of Hell and envy of Devils are able to spue out.

Is there a sinne, which God, although he is infinitely mercifull, hath resolved not to pardon, it is confirmed Atheisme; this is the only treason, which man can commit against God. The injury which he doeth unto God, is in Blaspheming his sacred Name; robbing him of his Honour, and of all his Attributes; and that, which doth infinitely augment his sinne, is his persistence in it after such an unexpressible indulgence.

It is impossible, that all vices should lodge and center in one man: for I could never hear that any natural man was so vicious, but he had some good (I mean good, as the vulgar calleth it) quality in him. Many have accused such a one for being a Drunkard, another for a Robber, or a Cheat; yet some there will be still, who you may hear say, although such a one is a Drunkard, yet he is honest, or kind, or civil, &c. or of another, although he is a Robber, yet he is no Murderer; although a Cheat, yet he is no Drunkard: so that I say, there is no natural man so vicious, but there is something in him, which people will say is good: But an Atheist hath a nest of all vice in him; there is not a vice so detestable or deform'd, although it be against nature, but he dares make tryal of it; because he dreads neither God, or his Law. An Atheist will wrong, cheat, revile his own parents; he will murder his own relations, friends, or others, if it be for his interest, or pleasure; he will Rob, steal, defame, blaspheme, and what not? 'tis true he doth not alwayes do these acts, because he fears the Law of man, nevertheless his will is not backward, but prone to all manner of wickedness, what should hinder him? his conscience will not, because that is dead: but it quickneth again a little before his death, and then beginneth his rage and torment, then the Devils come about him, each busied in increasing his woe and misery, then Hell and Eternity is at hand.

There

There are many, who seeming to judge charitably of all men, cannot be perswaded there are Atheists. In these I shall soon correct their tenderesse. There was never a subversion of a legal government, but there appeared hundreds of Atheists; They at such times are called subtil Politicians, who finding such successe by making Scripture and Religion, or rather hypocrisie, a cloak for to cover all their wicked designs, imagin thence, that Religion and Scripture were invented for that same purpose, because it hath so well served their turns. Pray what is this but absolute atheism? yea more than this, if they see it is for their interest, to murder an innocent person or persons, yea were it a whole Nation; they will not stick to do it out of hand: if they stand in want of treasures, they will steal and rob it from the people, and tell them, it is for the good of the Commonwealth in general, although their intent is to make it good to themselves alone in particular. What crime is so great, but is committed at such times. There is no History that treats of Rebellion, but may be a president of Atheism.

Here may be questioned, Since that an Atheist hath utterly lost his right reason, whether God cannot be moved through his goodnesse or mercy, to create a new understanding or reason in him? The Solution of this question take out of these two subsequent conclusions.

1. There is nothing imaginable to be created, which exceeds Gods absolute omnipotence. God as he is infinite in power, his acts are also infinite: as he is omnipotent, he is all-creating. Hath he not created Angels, men, the world, and all things therein contained? I conclude then, that the restitution of an Atheist, is possible through God's absolute omnipotence.

2. God is infinitely perfect whose perfection is revealed to us through his most perfect attributes, which are, his omnipotence, justice, mercy, goodnesse, &c. it is certain these are all perfections in the highest degree. The concordance or agreeing of these attributes one with the other is no lesse a perfection: for should they disagree, it would be an imperfection not to be conceived in the most perfect being. This premised, I infer, That God is omnipotent according to the concordance of his attributes; what is there but God can effect it if agreeing with his attributes? Possibly you may object, God cannot recall a thing, which

which is past; as that a man, who is now, should not have been; or that a man, who died this day, should not have died; or that he can not make a Devil an Angel, &c. I answer, That the effecting of these acts is disagreeing with Gods attributes*, namely * Take
 with his unchangeable, or ordained will. His ordained will is, Attributes
 that man should die at a certain minute, that the Devils should here in a
 remain damned to all eternity, that a thing should passe without large sense
 being recalled; for should God recall his will, he would contradict himself, and therefore such is not to be supposed. God, no question, can do greater things, and therefore his power is not to be doubted in lesser. I conclude hence, that it is disagreeing with Gods ordained will and justice to restore an Atheist, Gods profest and greatest enemy, who therefore deserveth the rigor of Gods justice; and although Gods mercy is infinite, yet it must agree with his justice. Can Gods mercy extend to an Atheist; or can he have compassion with that, which is altogether evil and contrary to his nature? No certainly, for the object of Gods mercy must be good, be it never so little. An Atheist onely is a sinner against the holy Ghost, he is such whom to sanctifie is disagreeing with the nature of the holy Ghost. What shall or can the holy Ghost cast his beams upon that, which is altogether evil? Here may be demanded, How doth the holy Spirit then manifest it self to any, since all men are sinners, and all sinners are evil?

I answer, That all men, except Atheists, have some spark of good lodging in them, upon which the holy Spirit doth work, and which it doth increase and cherish, whereby at last a man weareth the habit of sinning.

Object. An Atheist may save a man from drowning, but in so doing he doth a good act. *Ergo*, An Atheist hath still some spark of good resting in him.

I answer, That it is in no wise a good act, neither doth it proceed from a good principle, or is it directed to a good end. The ground upon which he doth it, is upon consideration, that were he in the same case, or the like, he would be glad another should do the same to him; so that it is for his own ends; for otherwise did he imagine, that a man's drowning might conduce to his benefit, doubtlesse he would never prevent it.

The second Representation of the extirpation of a habit is, when

there yet remaineth some spark of good ; which is inherent in all natural men, though in an unequal proportion, according to the prevalence of the evil habit. What soul is there so rooted in iniquity, which doth not sometimes a good act (*per se*) through it self ; and this is a sign, that there is a good disposition latent in all men. A murdherer, soon after he hath committed that hainous crime, is immediately checked through the sting and light of his conscience, reasoning that God is just, and thence dreads his wrath. Now to dread God is a good action proceeding from the instinct and remaining sight of the soul, which is also a good principle, and consequently is a mark, that he is not totally evil. You may reply against the consequence, and argue, That the Devils dread and fear God ; but the Devils are unable of effecting a good act, and therefore fear in a murdherer is not a good action. I answer, That the fear of God naked, and not cloathed with a repentance, and effluence from a good principle, doth not imply a good act, and therefore the naked fear in Devils abateth nothing from their evil : but as to a murdherer in fearing God's justice, wisheth he had not committed the fact. Fear brings with it a great unquietnesse of mind, but a man naturally wisheth the removal of any unquietnesse of spirit, and therefore a murdherer wisheth his crime undone, with a resolution, questionlesse never to attempt the like again, which is a kind of repentance. But here you seem, to charge me with a second objection, That many murdherers after so villanous an enterprise are not posselt with any fear of God's justice, unquietnesse of mind, or any other kind of repentance, but persisting in their pravity and wickednesse, and affirming untill the last, that were it to do again, they should not omit the doing of it. I answer, That these wretches are in no tittle differing from Atheists, since they wilfully blot the remembrance of God and his Laws out of their consciences ; for otherwise it were impossible, but they must be surpris'd with fear.

CHAP. XV.

Of the Means and Manner of Man's escape and Restoration.

1. What is requisite for a man to consider in order to his escape and restitution.
2. How a man may naturally find out a means tending to his restitution.
3. The description of God's mercy.
4. The explanation of the precedent description.
5. The act, through which God's mercy doth succour a natural soul in her contention.

I. IT is not enough for man to be sensible of the danger, wherein he is, but it behoveth him further to lay out for a means of escape and recovery; wherefore it will be requisite to explain,

1. That there is a means for man's recovery.
2. How those means are to be procured.
3. The disposition of will whereby a man is to procure that means.

II. Man, being awaked through the repentment of his perilous condition, makes a search (*omnibus naturaliter sui salutem molientibus*. All beings naturally endeavouring their preservation,) through a spark of that dusky light still glowing in him in-to all probable means, and infers from that ordinary maxime, (*Simile simili conservatur*. All beings are preserved by their like) that the soul being a Spirit, she must also expect her preservation from a spirit; hence concludes, that the same spirit, to whom he acknowledgeth his Creation and existence, must be the onely means of his preservation and restitution. The soul having now discovered a means, she directs her next aim to a further search. How and whereby to procure the said means, she argues with her self; God through his goodnesse hath given me a being (*Summum Bonum est sui maxime diffusivum*) And the same attribute, which moved him to confer an essence upon me, will certainly move him to preserve it from perishing, and restore it to

its primitive state. This produces a hope in the soul, which is a middle passion between a certain knowledge, and an utter despair, partaking somewhat of an assurance, and as much of a Despair. During this anguish, the soul further disputes with her self, God is good, and therefore will save her; on the other side her conscience accuseth her, in that she hath put her happinesse at a stake by offending against the goodnesse of God, and defleeting from her primitive perfection, which (no doubt) but God's justice will be satisfied for. God's justice is an attribute, whereby he separateth all those from his presence, that are unlike to him. The soul now in a tempest surrounded with innumerable waves of doubts and commotions of spirit, laboureth with all her strength to come to an anchor, or to make for a harbour; here she beats against the rock of God's justice ready to founder, then bears off again to Gods goodnesse, and saves her self from danger of the first stroak; yet the same perill being imminent upon her, she agreeth with her self to steer another course, whereby to consult her safety, at last lighteth upon an infallible Pilot: God's mercy, which brings her clear off to a harbour of assurance and quietness, which is a natural faith.

III. God's mercy is an attribute, through which he is moved to succour a perishing soul labouring for its own recovery. This attribute (*ὁ ἀνθρώπου ἐλεος*) according to the capacity of humane reason, is called compassion and pity. Compassion in us is an endeavouring to help a man grappling with his misery. The same compassion hath a resemblance to that, which is in God, although infinitely inferiour to it: for we spying the misery wherein a man is involved bearing down and overcoming his happinesse, do endeavour from a principle of love (through which we incline to what ever is like to us, and reject what ever is unlike) to support and aid him by adjoyning a force of the same nature to that, which is suppressed. But when a man is render'd altogether miserable and unsupportable, then we reject him, and our compassion towards him ceaseth, because his misery hath overcome his happinesse, or his evil hath totally expelled his good; and so he remains in a desperate state: for instance, A man who is a going to be hanged for sacriledge, and he persisting in his crime untill the last, is desperate and quite lost, as having no good in him: now our compassion cannot be moved towards

towards such an one, because he is totally evil, whom to pity proveth in vain.

IV. But to return to the exposition of the definition of mercy: First, I say it is an Attribute. God's Attributes are principles and perfections; whereby we conceive him (*κατ' αὐτονομίαν*) to effect acts really distinct one from the other. They are called Attributes, because we attribute them to him, thereby to make a distinction in our understandings of the several acts, proceeding as it were from distinct powers, which really do not: for in God there is no distinction to be imagined, that supposing a composition, and a composition an imperfection: so that what ever we attribute to any of God's Attributes, is to attribute it to God himself. *Nihil est in Deo quin sit ipse Deus*. There is nothing in God, but what is God himself.

V. The Act, which floweth from God's mercy, doth succour and strengthen the soul in this contention, by expelling the cloudiness, which the *material species* and depravate appetite of the body have cast about it, whereby they draw the soul from God, and inchant her to sottish pleasures.

God's mercy is distinguished from his goodness, because through his goodness he acteth that, which is good (*totâ suâ Naturâ*) in it self, or acteth upon good having no part of evil opposing it, as to create man or the world, or to preserve man in his innocence. His mercy hath a respect to good, as it is opposed by evil; as to redeem man is an act of God's mercy.

CHAP. XVI.

Of the Light and Darknesse of Man's practick understanding.

1. That Light and Darknesse are analogal to principles of good and evil.
2. Queries concerning Light and Darknesse.

3. *The two kinds of Light. What the first Light is, and how it produceth the second Light.*
4. *What the Habit of Light is: That the first man acted without habits. How a habit is acquired.*
5. *That the first man acted through a natural disposition, and not through any habits.*

I. **W**E have sometimes made mention of Good and Evil, Light and Darknesse, which being in this Treatise stated the two principles of mans actions, whether good or evil, it will not be impertinent to unfold the nature of each. By the way you are to take notice, that Light is analagous to the principle of good, and darknesse to the principle of evil, which analogy containing a clear and expresse emblem of good and evil, we shall therefore the rather retaine its *Analogata* for to explain.

Col. 1. 12,
13.

II. Concerning Light and Darknesse may be inquired, 1. What Light is, or what the habit of Light is. 2. What Darknesse is, and how it is to be taken in this place. 4. How it is otherwise called. 5. How it got its first footing in man. 6. What proportion there is between the remaining Light, and this habit of Darknesse. 7. How two contrary habits can both inhere in the same subject at the same time. 8. Whether the habit of Light is a *habitus per se*, and the habit of Darknesse a *habitus per accidens*. 9. How one contrary habit doth act against the other. 10. How the one at last happens to extirpate the other.

III. Light, as you may know further in the second Book, part 2. is either primitive or derivative: The first is called *Lux*, and through its emanative power is by some said to cause the second, otherwise named *Lumen*: or in *English* the former may be rendred a *Light*, the latter an *Enlightning*. The soul her self is the primitive Light, which irradiates or enlighteneth the whole body. This illumination is more splendid and of greater lustre in the brain and animal spirits, than in any other part, because the *Lumen* is reflexed through a repercussion against the arterial and membranous parts of the brain.

IV. The habit of Light is nothing else, but the facility or easinesse of the first Light in actuating the second, which happeneth through

through a lesse opposition of the organ, and of the contrary habit of darknesse. But I shall explain my meaning more amply. The first man in the state of his integrity had no habit in him, whence his acts proceeded, but were effected through a natural disposition and principle of good, which God through his bounty had conferred upon him. This natural disposition produced its first acts as perfect, or with the same facility, as it did the following acts; for otherwise man could not be supposed to have been created perfect.

V. Hence it appears, that man at his first creation had no habit, for a habit according to Philosophers, is (*Habitus est qualitas adventitia ad operandum cum facilitate*) an acquired quality, through which a substance is inclined to act with ease. Observe then, 1. It is an acquired quality, that is, not natural. 2. That through a habit we do operate with ease, which supposeth there was a difficulty of working before we had acquired this habit. But wherein lay the difficulty? either in the power of acting, or in the instrument, or in the object upon which it acted. There could be no difficulty in the power, for that inhering in the substantial form is unalterable. *Ergo* in the instrument and object. Now then the difficulty in the instrument and object is removed by often fitting the organ to the object, and the object to the organ, and so you see a habit is acquired through many repeated acts. Wherefore the first man in his entire state needed no habit, he acting all things naturally, and with ease: His organs were all perfect, and had no resistance in them against the power, or no unsuitnesse to the object; so likewise the objects were all fitted to their several organs.

CHAP. XVII.

Containing rational discoveries of Mans primitive, and second estate.

1. That Man was created most perfect. *A proof from reason, inferring God to be a most rational spirit.*
2. That Man by means of his first and second light, understood all beings perfectly in their proper natures, as they were.
3. That the first man did not sleep during his incorrupt estate.
4. That the first man did eat and drink.
5. That the first man would have generated in the same manner, and through the same parts, as he did afterwards, but without that shame and sinfull lust. That there were no co-Adamites. The absurdity of that blasphemous opinion touching præ-Adamites.
6. That the first man was beyond danger of erring in any action proceeding from his soul.
7. A rational inquiry into the first sinne, and knowledge of the first Commandment.
8. The manner of man's fall proved by reason. His punishment for the breach of the first Commandment.
9. A further collection of man's punishment for his first sinne. That a present unavoidable temporal death was part of mans punishment, and not a present unavoidable eternal death.
10. That man after his fall was not become utterly evil.
11. An enumeration of the reliëts of Good in man.

TO tell you how darknesse first ceased on man, it will be necessary to examine and dive into his first creation, the state and manner of it, and hence, by way of consequence, to deduct the casualties and accidents, to which he was exposed. First, Beyond all arguments

Man was created most perfect in his essence and operations, because whatever is immediatly created by God must be perfect; the reason is, in that God is a most perfect cause, and therefore his immediate effects and acts cannot but be most perfect; and

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man above all, he being created according to God's own image. You may demand how I come to know that? I answer, that man may easily apprehend, that God is a spirit, because his substance is immediatly imperceptible through any of the external senses: were he material, his body would be perceptible through its trinal dimension of parts, neverthelesse his acts upon material objects are but mediately, every minute perceived by us through the said intermediate actions upon material objects. Secondly, We know that he is most rational and understanding, because Right Reason cannot but judge all his acts to be most Rational: on the other part, the soul knoweth her self to be a spirit, because her essence is also immediatly imperceptible by any of the external senses. That she is rational needs no proof. Wherefore hence it is apparent enough, that man was created after God's image.

I I. The first light then, being most perfect, produced also its second light in no lesse perfection; particularly that, which is instrumentall to its Reasoning, which made man capable of understanding all things in the world in their own nature: Besides there was no resistance or obscurity in any of the objects; because they, being all created for the service of man, had their natures (as it were) writ upon their breast, so that herein they were at the command of the understanding: not only so, but his will exercised a free and despotick command over all God's creatures, whether inanimated or animated, which latter, and particularly beasts, were all of a meek and obedient nature, otherwise they could not have fitted man's occasions.

I II. Whether man in this state naturally slept or not, is dubious: yet it is more probable, that he did not; because sleep ariseth from an imperfection of the Body, and wearinesse of the animal spirits, which is not to be supposed in so perfect a creature. Besides sleep would have detracted part of his happinesse, because an intermission from joy is a kind of misery; and a total abolishment of joy is a total misery.

I V. Man did eat and drink; for otherwise many parts of his body, as his stomack, guts, liver, spleen, kidnies, bladder, &c. would have been formed in vain.

I V. Man, had he continued in his primitive state, would have generated, and in the same manner through the same parts, as he did

did since, although without that sinful lust and shame : The reason is, Because the spermatick parts, or genitals would else be supposed to be superadded for no end.

It is probable that *Adam* did not generate in his corrupt state ; for if he had, he would have begot children (since that through his entire perfection, he could misse of no end in any of his actions) who not participating of original sinne would in like manner have continued their race to this day, and have remained in *Paradise* ; but finding, that no such *Paradise* can at present be discovered upon earth, and that all the best parts of the earth are known, we may justly inferre the probability of the fore-stated conclusion. Possibly you may object, That *Paradise* is in another material world, as supposing every Star to be a world. I answer, That your objection is absurd, and hath no apparent foundation, as I have proved in my *Physicks*. The same reasons do also shew the absurdity of that blasphemous opinion touching *Pre-Adamites* and *co-Adamites*.

VI. There was no action or pleasure, if immediately proceeding from the soul, wherein man could erre : because the soul, having a resemblance to the Divine Nature, had in it self no contrariety or principle of error. Neither could he sinne in the pleasures of his mind, they deriving from the contemplation of his Creator.

VII. It is also certain, that God, as he is Creator and King of, and over all his creatures, did require obedience from them, whereby they should expresse their subjection, humility, and love to him : Wherefore (no doubt) he imposed some one commandment upon them, which would be sufficient to testifie their obedience and subjection. This command did not reach to the immediate or pure object of the soul, but necessarily to the object of the Body. The command upon the object of the body must have been an interdiction of some one of its pleasures, to which it was inclined : otherwise had there been but little difficulty in it, it would have expresse but an indifferent observance, or love. The pleasures of the body consists mainly in eating ; so that it is probable some edible thing was interdicted, from which man was to abstain. And although this command did immediately extend to the body, yet there being that sympathy between the soul and it, the one could easily move the other, whereby it did also mediately reach the soul also.

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The breach of this commandment must have threatned some punishment for to imprint a fear upon man.

VIII. This punishment was imposed upon that, which should be the first inticer, which necessarily was the body through its appetitive faculty. No question but man sustained also the force of the Devil (because we are yet minutely attached by him) who wrought upon him in a disguise (for had he appeared to man in his own shape, man would have shunned him) more by cunning and stratagems, than as an open enemy; By diverting him from thinking upon God, in drawing his understanding to a sensual object, so that he wrought first upon man's body, in proposing some pleasant object to its appetite, which did soon entice the soul's will.

Wherefore Man could not have deflected from God without yeelding to this attraction of the Devil, and ceasing for a while from contemplating God, to whom had he but returned in time, it would soon have recalled him from all the allurements of the evil spirit. However man went on in hearkning to the evil spirit, And so much the more, because it is probable, the Devil appeared to him, professing an entire friendship in proposing somewhat, which might conduce to the amendment of his condition, and pleasure of his Body. This done, the Devils work was the better half finisht. Hereupon man yeelding to the Devils persuasion, and to please his lust, soon after forfeited his happinesse: His distinct knowledge of things failed him; his fruition of God was lost; his bodily appetite was now more increased than ever, and thence committed the same sinne a thousand times over. All God's creatures disobeyed him; beasts grew fierce, herbs poisonous. The Elements lost their purity, the Sun yeelded of his light and brightnesse, the starres of their virtues and influences. This great alteration immediately hereupon succeeding, he soon perceived that he had sinned, and at the same instant felt the punishment for sin: he needed no trial, for his conscience yeilded.

Now let us collect what man's punishment was for this alone first sin.

IX. It was not a present, unavoidable, eternal separation from God; for then God would have cast him into hell immediately, like he did the Devil, whose crime was unpardonable, since he aspired to have been God himself, and in whom there remained

not the least spark of good, but being rendred altogether evil, there remained nothing in him worth saving. Hence by the way I confirm my former proposition, that man had a principle of good remaining in him after his fall: for otherwise God should have cast him into hell immediately.

2. It was a present, temporal, unavoidable death, namely a separation of the soul from the body; which he soon concluded from the alteration of his body and disposition to sickness, through which his body at last must necessarily be brought to a temporal death: yet this temporal death did not exclude an eternal one, in case he neglected the most gracious means destined for his restitution.

3. It consisted in a partial unlikenesse to God: for before he knew all things distinctly by one operation of mind, now by many, then without error, now subject to mistakes and errors.

4. The losse of Paradise. The seat, wherein he was first constituted, was before full of all perfections, abounding of all things for the good of man: all herbs were nourishing; flowers fragrant; beasts of a soft, pleasant, and delightfull nature; the Elements in their splendour; the Earth fruitfull; the waters sweet; the air clear and wholesome; the fire pure. Soon after all was changed; some herbs became venomous, others still reserving some goodnesse in them; some flowers changed into a stink, others retained yet some sweet odour; so some Beasts became wild, others remaining tame; a part of the earth remained barren, and a part fruitfull, &c.

X. Had man then become quite evil through this one act, all that, which had been subservient to him before, would now have become noxious and destructive to him. His knowledge of God was not totally blotted out, his knowledge of all other things was not quite abolisht: for he knew them still, although not with the same distinction and evidence. Since then it was so, that part of mans enjoyments were yet remaining, and that part changed into crosses, it is probable, that a part of the good in man remained, and a great part of evil entred; for had man not retained some good in him, God would have taken all good away from him.

Now after the shipwrack of man's happinesse and admission of evil,

evil, let us also examine what remained in him, that might still be termed good.

1. There remained in man after his fall a knowledge of his Creator.

2. A Reasoning faculty.

3. His body as yet in health, but disposed to sicknesse and death.

4. A place wherein to live-

All these Relicts were much impaired to what they were; nevertheless God left them for some end: namely, that they might serve man as a means for his restitution.

I had almost forgot to insert among man's remains his free-will: for no question the first man had a free-will to good and evil, which it is probable remained also partially in him after his fall.

CHAP. XVIII.

Of the manner of the Suppression, Extinction, Predominance and Triumph of the Habit of Good.

1. The repetition of some of the principal principles of this Treatise.
2. What it is that hindreth the Habit of Good.
3. How the good Habit happens to be deadened, and overcome by the evil habit. How the good Habit happens to suppress and vanquish the evil habit.
4. That we are apt to incline most to those things that are forbidden.
5. A proof inferring darknesse to proceed from the prevalence of the corporeal appetite.
6. Why it is, that a man must necessarily die. The ground detected

upon which the Papists were induced to state a Purgatory. Their error rejected.

7. That the proportion of these two Habits is various in every individual subject.

I. **B**Y what hath been proposed in the fore-going Chapter you may now fully comprehend the nature of Darknesse or habit of evil, and how man fell into it. You may further remember, that man had no habit of Good, because nothing resisted his natural powers: wherefore it is no absurdity to assert, That man acteth now good and evil through acquired or infused habits. Moreover let me desire you to take notice, how man fell into sinne: *viz.* That it was through the inclination and enticement of his corporeal or sensual appetite, and that thereby his reason was not drawn aside *violente* or *coactive*, but *inclinative* and *dispositive*: that through this the body, as it were, got the upperhand of the soul, insomuch that after the soul had submitted her self once to the command of the body, she thereby forfeited her superiority: that the body after the fall being corrupted and grown lesse serviceable to the soul, it had stronger influence upon the soul than ever: That the habit of the soul is nothing else, but an easinesse of working its acts, whether good or evil; which is attained through frequent repetitions of the same acts, and through it at last makes the organs easie, and the objects fitted.

II. Whereas all habits presuppose a difficulty, through which the former acts have been hindered, that, which hindreth the good habit, is the forcible drawing and prevalence of the sensual appetite, whereby it is set on and inclined to sensual acts, which for the most part prove to be evil.

III. Wherefore this good habit is nothing else, but the same principle of good somewhat deaded and diverted by the sensual inclinations of the body: for as a flaming fire may be deaded and choakt through black smokes, whereby it is hindered from flaming, and yet continue a fire, and may blaze again, were the smokes but discussed; in fire we see, when it begins to blaze a little, by degrees it blazes more and more, untill at last it gets to a flame, which keeps its life the better, and expelleth the smoke more vigorously; but if it begins to leave flaming, and come to blazing, and from blazing return to a deadish light, then the smoke overcometh

overcometh it, and deads it again : Even so it is with the habits of the soul ; man's light keeps blazing, untill it is deaded and choakt through the dark smokes of his inordinate sensual appetite ; but if it be ventilated, and stirred up by frequent repetitions of good acts, it is vivified, and lasteth. This light, if it is once come to an intyre flame, it can never be totally darkned : possibly it may now and then remit somewhat of its lustre ; but in case this light doth only blaze a little now and then, or it may be flame a while, yet if it rise not to burn clear quite through, neverthelesse it will perish, and is to be counted for a flash.

IV. It is then the inordinate appetite of the body, which smothereth up the light of the soul, because through it she is led aside by harkning altogether to its motion, and suffering the understanding and will to bend to its pleasures, and especially to such which are forbden.

Nitimur in vetitum semper cupimusque negata.

That, which the Law doth most from us require,
Is most gain-said by our perverse desire.

Herein is the habit of the soul deaded and overcome by the evil habit of the body.

The soul may produce good acts although with difficulty, because she is opposed by the evil habit of the body : But the oftener those acts are repeated, the more the soul doth triumph over the body, and subdueth it under her command, yet not so as to tie up its whole force ; because the body being once corrupted cannot be reintegrated in this world, there remaining a debt to be paid ; to wit, death, which was contracted, as hath been shewed, through guilt of the first transgression. You may here enquire, Why God through his infinite mercy doth not forgive man this debt of death ?

I answer, That God through his justice cannot, that requiring plenary satisfaction, otherwise God's threatnings and ordinances might be supposed to be in vain.

V. From all this it appeareth, that the darknesse of the soul proceeds from the predominance of the corporeal appetite misleading the soul, and consequently that the good habit of man

is *per se*, and the evil habit *per accidens*; for the same perfections, which the soul of the first man was indued withall, are also conferred upon every individual soul, because each of these doth immediatly emanate from God, and therefore is most perfect: *Ergo*, the perfection or good of every soul is inherent in her *per se*, and the evil, which doth assault her is *per accidens*; for it is from the body. By the way let me tell you in case you doe maintain originall sinne, and assert it to be propagated through infection, you must agree in this very tenent, *viz.* that it is propagated through the infection of the body, which is *per accidens* to the soul: for it cannot be propagated through the infection of the soul; for that was created pure and perfect: or otherwise you must affirm, that the soul is *ex traduce*, which is impious and atheistical.

VI. The body, since it is so corrupted, must be purified, which cannot be, unlesse the soul leaveth it for a while: but as for the soul, if it deserteth the body with an assurance of, and in God's mercy and goodnesse, it needeth not to die, because it was not essentially corrupted, but accidentally; and expiring out of the body arrives to God's presence in the same purity, and perfection, as it was indued with at her first infusion. Wherefore the Papists do most heretically mistake in arguing, that the soul for to be purified must abide a while in Purgatory. Here may be objected, If the soul remaineth good *per se*, and the evil be *per accidens*, then the soul of every wretch being dissolved from the body is entirely pure and holy? I deny the consequence; for as long as God's justice is not satisfied for their sin committed in the flesh, both their body and soul must necessarily be damned: but as for the soul of a regenerated man, the guilt of his sins being taken away, and God's justice satisfied in this world, the soul when dissolved from the body remaineth essentially and naturally good without any further purification.

VII. The proportion, which there is between these two habits, is very various and different in most persons: for we see, that some persons their bodies and appetites are more depraved than others, and consequently their good habits more deaded, and that some have much more ado to rebuke their sensual inclinations than others.

CHAP. XIX. Of Original Sinne.

1. *How it is possible for two contrary Habits to inhere in one subject.*
2. *The absurdities, that follow this Assertion, viz. That the evil habit inheres in the soul per se.*
3. *In what manner the Habit of good is taken to inhere per se in the soul.*
4. *That God created every man theologically good. Several Objections, relating to the same assertion, answered.*
5. *How the soul partaketh of the guilt of Original Sinne. The opinion of the Synod of Rochel upon this matter.*

I. **N**OW we may easily explain how two contrary habits can inhere in one and the same subject. No question it is impossible two contraries should inhere both *per se* in one subject; for the nature of contraries is to expell one another out of the same subject: Yet it is not repugnant but that two contrary habits may inhere both in one subject, provided the one exist in it *per se*, and the other *per accidens*, or that they be not inherent in one partial subject, although they may in the total: for it is possible for a man to be afflicted with two contrary diseases in two parts of his body, yet both are sustained by one total subject. In like manner may the evil habit be principally and originally inherent in the body, and the good habit in the soul, yet both these are contained in one man.

II. Notwithstanding all this, there are some, who obstinately do affirm, that the evil habit inheres in the soul *per se*, but how do they prove it? Certainly upon these suppositions.

1. That the habits may be altered, and the substance remain the same.
2. That the first man acted through habits.
3. That the good habit being remoyed the evil habit succeeded in its stead, and consequently that an Accident doth migrate è *subiecto in subiectum*, which is against their own maxims.

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These suppositions being all false, as hath been proved at large, cannot be a firm foundation for any conclusion whatever they have built upon them. And therefore I conclude again,

1. That in the first man there was a natural disposition of acting good, but no habit.

2. That there became two habits in man after his fall, the one of good, and the other of evil.

III. That the habit of good inheres in man *per se* (*Quatenus actionis principium dicatur anima, inest ei habitus bonus per se, aut prout habitus sit accidens, secundum istud potest anima attribui inesse per accidens, quia ipse habitus est accidens; quæ tamen mihi est inusitata locutio.*) And the habit of evil *per accidens* (*Non quatenus proficiatur ab anima tanquam à mali principio, sed duntaxat quatenus sit anima instrumentum.*) Here one may object, If an evil act proceed *per se* from the soul, than the evil habit is also inherent in her *per se*. As to this, the same I may argue from a good act, and thence infer the inherence of the good habit *per se*. But it is certain, that two contrary opposites (*secundum idem ad idem*) cannot exist together at the same instant in the same subject; so that the one habit must necessarily *inse per se*, and the other *per accidens*. Before I go farther, let me tell you once for all, when I say that the good habit is *per se* in man, I do not imply, that it is *ex se*, but *è Dei gratia, è voluntate & potentia divina ordinata*; to deny this is to rob God of his honour, and is no lesse than a blasphemy: wherefore it ought to be a great caution to all men, how they assert good habits *per se*, or good works *per se*, lest they offend.

IV. God creates every man theologically good, that is, God infuseth the soul theologically good into the body being good also: for otherwise God would be supposed to joy a good to evil. How could the body be evil before the advent of the soul? If it were evil, it must be morally evil (for there is no doubt but it was and remaineth physically good) but that cannot be admitted, because there is no moral evil without a rational will. Good and evil is taken in a double sense:

1. Good or evil is that, which is agreeable or disagreeable with the Law of God.

2. Good or evil is, which is convenient and suitable, or inconvenient.

convenient and unsutable to a being.

According to the first acception, The soul is infused good into a good body, because of the reason fore-mentioned. But according to the last it is not.

Here may be demanded, Whether it agreeth with God's goodness, to infuse a good soul into an unsutable body.

I answer, That it doth not detract one tittle from God's goodness: for he hath ordained, that man should multiply and increase, and therefore hath given man a power of increasing and multiplying. The power, which man exerciseth to multiply, is through propagation of his body only, and uniting the soul to it. The body being then prepared for the souls reception, the soul at that instant is raised out of the body (*è potentia materia receptiva*) not out of it, as *è materiali principio eductivo*, like unto material forms, but by the divine power, which is ever present where God hath ordained his benediction: so that God doth not withdraw his power of creating a soul, when ever a body is prepared for it, although that body is generated by the worst of men, because God hath ordained it; for God doth create a soul, not because a wicked man hath disposed a body for the reception of it, but because of his ordained blessing to mans increase.

V. The soul being united to the body, immediately partaketh of the guilt of original sinne. What original sinne is, me thinks, is not distinctly expounded by our ordinary institutionists. They say, It is a natural disposition to evil, naturally descending from Adam to all men; it is that, which is called, *The sinne dwelling in man, The Law of our members, The old man, The flesh, The body of sinne, &c.*

First, I demand, What sinne is? I shall be answered, That it is a breach of God's Law. *Ergo*, A sinne is an act: for to break God's Law is to act against God's Law. A disposition, say they, is, whereby an agent can act. *Ergo*, A disposition to sinne is no sinne, because a disposition is no act, but whereby we can, or do act. So that original sinne is the first act of sinne, which the first man acted, who comprehending in him whole mankind, since all men were to descend from him, the sinne, which he acted, was also acted by whole mankind, and consequently the guilt of that sinne is imputed to every man. The habit of sinne being entered

tered through one act, whereby we are render'd prone to evil, and commit actual sinne, or do act sinne, the same habit and disposition hath also ceased on all mankind. So that original is rather the first actual sinne, after which followed the habit of sinning; and with the original or first sinne of man, the habit of sinning is withall communicated to mans posterity. This very sense may be drawn from their own words, although it was against their intentions.

The Synod held at *Rochel* in the year 1607. in the moneth of *March*, rendreth her self in these words, as further appears by their Confession. *We believe, that whole mankind, ever since Adam, is corrupted with such an infection, as original sinne is, to wit, an original defect. And in the 11th Artic We believe, that this defect is a sinne, and is sufficient to damn whole mankind from the highest to the lowest, yea moreover the Infants in their Mothers womb. What can any body apprehend by this original defect, but an actual sin, or how could Infants be guilty of it?*

CHAP. XX.

Of the manner of Man's multiplication.

1. *The state of the controversie.*
2. *That the Rational Soul is not generated, or produced by generation. That there are three kinds of productions out of nothing.*
3. *That the Soul is not propagated either from the Father or Mother.*
4. *That impious opinion concluding the Rational Soul to be generated tanquam ex traduce, confuted.*
5. *An Objection against the Authors opinion answered.*
6. *That the foetus before the advent of the Rational Soul is informed with a form analogal to a sentient form.*
7. *That God is the remote cause of man's generation.*
8. *That man doth generate man naturally and per se.*

9. *The opinion of Austin, Jerome, and others upon this matter.*

I. **I** Had almost in the last Chapter fallen unawares into that intricate Controversie about man's multiplication and increase, but fore-seeing the extent of it, I thought it fitter to retire myself to this Chapter, and treat of it here singly.

Man consisteth of body and soul: as touching the body, there is no doubt made of it, but that it is propagated *tanquam ex iraduce*. All the stumbling is at the rational soul, whether she be infused or propagated in like manner as the body: or I may state the Question thus, Whether the soul of man is created or produced by generation?

Conclus. The Rational Soul is not generated or produced through generation. I prove it. That which is indivisible is produced in an indivisible part of time, namely in an instant. But the Soul of man is indivisible, and therefore is produced in an instant. Again, that, which is produced in an instant, is created and not generated: Because generation doth follow alteration, which is by succession. *Ergo*, The Soul would not be constituted in an instant, but successively, and consequently would be corporeal.

2. If the Soul had a power of generating a Soul, it had also a power of destroying it by means contrary to those, wherby she had produced it.

3. *Generatio unius est corruptio alterius, & vice versa: Ergo, Quicquid est generabile est corruptibile.* The generation of one form or being is the corruption of another; and the corruption of one is the generation of the other: *Ergo*, What ever is generable is corruptible, and what ever is corruptible is generable: So then when ever the soul is generated another soul or form is corrupted; And when the soul is corrupted another form or soul is generated, which may be, as the *Indians* hold, the soul of an horse, or of an ass, &c. and so the soul is made material: To this possibly your answer will be, That it is so in natural productions, but not in supernatural. I ask you then, Why do you object this for an argument to prove the propagation of the soul, *viz.* that man (*Homo generat sibi similem*) doth generate his like, otherwise he would be inferior to a beast. *Ergo*, You as-

fert that man doth generate naturally like unto other creatures.

4. If otherwise to generate its like were a property belonging to supernatural beings, then Angels would have a power of generating other Angels, which they have not. Or if this power of generating were onely superadded to one kind of supernatural beings, namely to souls, then a soul would be more noble than an Angel.

5. There are but two wayes of producing a substance, to wit (*è materia præexistente, vel è nihilo*) out of a preexistent matter, or out of nothing. What, is the soul produced out of a preexistent matter, as out of a *potentia eductiva*? If you grant this, you expose your self to be suspected for a *Plinianist*, and to assert the soul to be material. *Ergo*, It must be created out of nothing. Now there are three kinds of productions out of nothing :

1. *È nihilo termini ulterioris, sed aliquo materia.*

2. *È nihilo materia, sed aliquo termini.*

3. *È nihilo materia, & nihilo termini.*

Here you must take *terminus* for *forma*: for what is it, that doth terminate the matter, but the form? and so the world was created *ex aliquo materia, sed nihilo termini*: for it was created out of the *Chaos*, which was a rude matter without an *ulterior forma*, or *terminus*. After the same manner was the body of man created: for neither the *Chaos*, or *dust*, out of which man was created had an ultimate form. Neither are you to imagine here, that generation; and this kind of creation is one: for although in generation there is not that form existent in the matter, which is intended in it, yet generation is *ab aliquo forma ultima in eadem materia præexistente*. The last kind of creation is exemplified by the creation of the *Chaos*, of the *dust*, of *Angels*, and of *Souls*. This manner of production is proper only to an infinite power: But you may demand, Why cannot God invest the soul with this power? I answer, It is impossible to God (*Non simpliciter sed secundum quid*) and to the nature of the soul. As to God it is impossible; because should he confer his infinite power upon man, he would make him equal to himself.

2. It is impossible to the nature of the soul; because she being limited, cannot be unlimited or infinite at the same time. *Omne quod est, idem quod est, necesse est esse.*

IV. Were

IV. Were the soul *ex traduce*, then she would be propagated either from the Father, or Mother, or from both. Not from the Father: for then the rational soul would be inherent in the genotype at the same moment of conception, which all grant is not: then from the Mother (as *James Hostius* his opinion was) which is absurd; for all grant that the Mother is a passive, and the Father an active principle; besides if so, men's souls would be extremely weak: not from both; for then the soul would be of a mixt nature, which is no lesse absurd.

Give me leave here to examine *Scaliger's* notion, which *Sennerius*, *Kyper*, and others do assume to demonstrate the manner of the souls propagation.

Scal. Exerc. 6. D. II. An anima catelli sit pars anime patris. Cur non? dividitur ad materia divisionem materialis anima: totaque est in sui parte, quod in plantis manifestum est. Gignit autem animam anima sui promotione, eadem sane ratione, quemadmodum a lampadis flamma flammam excipimus, illa nihilominus integra remanente. He moveth a Question, Whether the soul of a whelp is a part of the soul of the dog that begot him: And why not? For a material soul is divided according to the division of the matter, and she is whole in its part; which is most evident in plants. Wherefore a soul begetteth a soul by protruding her self, much after the same manner as we kindle a flame with a flame of a lamp, the which neverthelesse remaineth entire. Here *Scaliger* explains the propagation of beasts and plants; and others do impiously apply the same to the rational soul, and consequently make her material. But to the point, the rational soul cannot protrude her self in this manner, because she is indivisible: As for a flame, that protrudes its self, because it is divisible, and communicateth a part of its self to another combustible matter, and so raiseth a flame; but this is not so in the soul.

V. After the confirmation of my opinion, it is requisite I should answer to what may be objected against it. If the soul cannot generate a soul (may one say) or cannot generate his like, then man is inferiour to other living creatures, which do generate their like.

I answer, That man doth generate his like (for it is apparent, that the Sonne is like the Father) and that in a nobler manner than

than animals or vegetables, who do naturally generate their like as to matter and a corruptible form; but man doth generate the matter, and disposeth it for the reception of an incorruptible form: which done, the form is immediately united to it *in instanti*, not from the soul singly and originally, but from the divine power, which is alwayes concomitant to God's benediction, by which he hath through his ordained will freely tied himself. The divine power, being then alwayes present and concomitant to the generating soul, doth, as it were, give a rational soul to the plattick faculty of the genitures, when she is ready to unite it to the body: where observe, that the generating soul is a subordinate and mediate cause of the infusion of the other rational soul. The creating power of God is the primar, principal, and immediate cause of man's rational soul, and its production. It is the primar and immediate cause of the soul, because it createth her: God of his goodnesse and blessing doth give the soul now at that instant created to the generating soul, as to a subordinate and instrumental cause.

VI. By the generating soul I intend a material and divisible form, inherent in the genitures mixt out of that, which is contributed from the Father, and that other from the Mother. This form is analogal to a sensitive soul (but notwithstanding must not be counted to be of the same *species*) and doth informate the body of the Infant, untill the advent of the indivisible, immaterial, immortal, and rational soul, and then it doth acquit the name of a form, and becomes a faculty, power, and instrument to the said rational soul.

VII. God is the remote cause of man's generation and production, because God doth not immediately unite and infuse the soul into the body: for were God the *next cause* of uniting the soul to the body, then true enough, man could not be said to generate man; because the introduction or eduction of the form into, or out of the matter is the generation of the whole. Now then man is the subordinate cause of the soul and its infusion, by reason his *propagature* receiveth the soul, which is to be infused, from God, who is the primar and original cause of it.

VIII. *Conclus. 2.* Man doth generate man naturally and *per se*, although he doth not propagate the soul from himself. I
prove

prove it. He that uniteth the form to the matter, as in this instance of uniting the soul to the body, doth produce the *totum compositum*, as, to generate or produce the whole man: But man uniteth the soul to the body; therefore he generates or produces the whole man.

2. Man generateth man naturally and *per se*, because he hath an absolute (*secundum quid*) power of uniting the soul to the body: for otherwise he were inferiour to other creatures. This power is given him in these expressed words of Scripture (saying my purpose) *Let man multiply*: How could man multiply had he not this power? For did God infuse the soul immediately, as Divines generally hold, man could not be said to multiply, but God.

The generating soul therefore is the *Causa proxima* of the infusion of the soul into the body. Wherefore there are always souls ready (that are created at the same moment, when needfull) which are given to the generating soul: otherwise were its uniting power in vain.

V. It is well expressed by *Aufin*: *If the soul be seminated with the flesh, it shall also die with the flesh*. And by *Jerome*: *If the soul of man and of Beasts be ex traduce, then consequently both must be corruptible*. *Plato* in his *Dialog. Phaed.* inters the soul's advent from without, as an *Herculean* argument to prove her immortality. *Caelius Rhodoginus lib. 6. Antiq. Lect.* doth wittily expresse *Aristotle's* meaning of *ἐντέλεια* and *ἄρς*, the first whereof was asserted by him to be mortal, the latter to be immortal: And if I mistake not, he seems to affirm no lesse, *Lib. 2. d. gener. cap. 3. viz.* that *ἐντέλεια* is inherent in the sperm; but *ἄρς* is of a divine rice, and immortal. Well may *Tho. Aquinas* pronounce *ἀνθρώπου* upon all those, that should maintain the rational soul to be *ex traduce*, since most Heathen Philosophers did believe otherwise. What? because those dull *Lutherans* had not the wit to know that original sinne was propagated through the body, therefore they must revive that *Bombastin* opinion, concluding the soul to be propagated likewise, for to demonstrate her to participate of the said sinne. This we have shewed with more probability already; and therefore let us henceforth beware of so dangerous and atheistical an assertion.

CHAP. XXI.

Of Praëtick Natural Faith.

1. What a man is to consider to prevent his downfall.
2. Man's danger and folly: the Devils policy. A certain means whereby to be delivered from this imminent danger. The whole mystery and summe of man's salvation.
3. The main Question of this whole Treatise decided.
4. Scripture proofs (accidentally proposed) inferring implicit faith in a natural man to be justifying.
5. The general Rules of ipraëtick Faith.
6. The occasion of man's fall briefly repeated.
7. Fifteen Reasons against all passions.
8. Arguments against all bodily pleasures.
9. The military discipline of a natural man, instructing him to warre against all his enemies that oppose him in his way to his greatest happinesse.
10. The greatest and most necessary rule of this military art. A scandal taken off from Physicians.
11. Another great measure of the said Art.
12. Whence a natural man is to expect assistance in case he is weakened by his enemies.
13. Whether the soul expiring out of the body is to be an Angel, or for ever to abide without office. What the office of a separated soul is.
14. How long she is to continue in office. The consummation and description of the change of the world. The resurrection proved by reason. The description of the second Paradise concluded by reason.
15. To what objects the faculties of men, when possesst of the second Paradise, will extend. That they shall remember and know one another. That they shall eat and drink, that they shall not generate, that

that the same person, who redeemed man from his misery, shall reign over him in Paradise.

I. **A**Rt thou not stupified, or hast thou not lost thy reason through a confirmed Atheism, then what hath been hitherto delivered may take place in thee, and gain thee a full insight into thy past, present, and future state. On the one hand, you know your misery and pravity by comparing the course of your life with that rule, which is imprinted in your heart; On the other hand you may sadow your own strength, and since that is decayed and weakned, you may spie God ready to assist and succour you in this contention and strife against your enemies, labouring all to pull him down. But how to procure God's aid and succour, 'tis that, which I am about to advise you in. In the first place consider whose enemy thou art, and ever hast been, and what associates thou art adjoyned unto, under whose banner it is thou fightest; to what end, or what victory it is you expect.

II. As to the first, thou art God's enemy, and hast been so from the minute thou wast conceived in. The associates among whose company and number thou hast ranged and listed thy self, are Infidels, Atheists, Wretches and Devils. The Banner, under which thou marchest, and fightest, is Satans, or the Prince of Devils. The end and victory, which thou fightest for, (were it possible) is to throw God out of his Throne: Now, berhink thy self; art thou not a fool, that fightest against the mighty one, who is able to destroy thee in a moment? Art thou not blinded to fight with such associates? Were that mote but removed out of thy eye, thou wouldest soon be astonisht at their wickednesse, and detest their company. The Banner is as a vail cast before thy eyes to keep thee ignorant of the Devils aim and craft, which tends to lead thee into utter destruction. The Design, whereunto thou hast subscribed, is the greatest piece of rebellion and treachery. Now then, is it not time for thee to flie, and make thy escape? Yet a moment and God soundeth his alarm, and so ye are all laid in the ground, and cast into an everlasting dungeon. But whither canst thou flie, but God will pursue thee? Thou canst not cast thy self immediately upon God: for his justice doth judge thy crime high treason, and therefore unpardonable,

nable; so that thou art condemned to execution. First, satisfie God's justice, and then submit. But how may you enquire? Certainly, O man, if thou art to satisfie God's justice and to appease his wrath, then thou art lost, and cast away for ever, and yet since man hath sinned, man must surely expect God's wrath. Now, the means for thy escape is to cast thy self upon God's mercy, which is infinite, and therefore of an equal weight to balance his justice: and believe assuredly, that God's mercy will move his infinite wisdom to find out some way or other, whereby to satisfie his justice. 'Tis true, we have all sinned in one man, to wit, the first man; but if God doth send one righteous man into the world, who through his perfect obedience to the Law doth intirely recover God's favour, through his sufferings doth satisfie God's justice, through his death acquit us from the guilt and punishment of, and for the first or original sinne, and he afterwards rise again from the dead, as a Conquerour of Death and sinne, this one man's satisfaction and obedience is sufficient to blot out all men's guilt, and merit God's favour and acceptance for all men; because as the sinne of *one first man* is the original cause of all our sinnes, and as his sin is imputed to us, so the satisfaction of *one second man* (provided he be of the same stock, that we are of) is enough to satisfie for the sinne of that one first man, and consequently also for the sinnes, which we have committed, through the participation of that first sinne; and his plenar obedience, if it be imputed to us, as the first sinne was, is sufficient to compleat and perfect all our imperfect good actions, and to make them theologically good. But some may reply, That it is repugnant to man's nature, if he be of the same stock, that we are of, to undergo death and rise again, or to be born without sinne, which is requisite; for otherwise how can he be thoroughly righteous? You have great reason to doubt of Col. 1. 26, this; for it is a mystery, which doth exceed man's capacity, and
 27. is impossible for a natural man to dive into, or ever come to any particular knowledg of it, unlesse immediatly revealed by inspiration to some men, from whom it should descend to us. Nevertheless this very thing is possible with God, and therefore we ought not to doubt of it in the least, but according to that divine saying of *Solon, De Deo non est inquirendum sed credendum*: We are not to enquire of God, but to believe in him, and particularly

larly in his mercy and wisdom. This is the great mystery, ground and summe of our salvation.

III. But the main Question, that may be moved here, is, Whether this implicit faith may be termed justifying, that is, Whether man in believing inclusively in God's mercy and goodnesse, as including that God is most wise; and therefore can order or appoint a means for his restoration and redemption, and that he is mercifull, and therefore will order and appoint those means of salvation to such, who earnestly desire it, and believe in him. Mark I said also *Goodnesse*, for that is necessary to be believed into, because although that through God's mercy we are redeemed and restored to our primitive perfection, yet it is through his goodnesse, or grace as Divines usually expresse it, that we abide with him to all eternity.

To this may be answered, that it is not improbable: for, since it would be impious to affirm, that all children are damned, because they have not an actual faith, we may safely suppose, that God being infinitely mercifull will save them as farre as they have an inclinative faith, or a disposition to it: an actual faith cannot be required, because of their immaturity. If then children are saved through their inclinative faith, certainly this fore-mentioned actual faith doth counterpoize that of children. Besides, man in believing according to the state of this Question, doth his uttermost, and that from a good principle to a good end, which questionlesse God will accept of. Lastly, Men's consciences are even in this faith at rest and satisfied, and their hopes are fixed: but all this cannot be in vain. *Ergo*.

I V. I thought it not amisse (although beyond my purpose) to adde a Scripture or two. *Ezek. 18. 21, 22. But if the wicked will turn from all his sins, &c.*

Rom. 1. 19, 20. Because that, which may be known of God is manifest in them; for God hath shewed it unto them. For the invisible things of him, from the creation of the world, are clearly seen, being understood by the things, that are made, even his eternal power and God-head, so that they are without excuse. Is not this a plain Text, testifying, that there is a natural faith in the hearts of all men, or at least may be. Luc. 13. 3, 5. Acts 11. 18. 2 Corinth. 7. 10. Psalm 36. 40. Prov. 26. 25. John 3. 3. Galat. 5. 6, &c.

This implicit faith is generally called faith in God, *Heb. 6. 1.* *2 Cor. 4. 3.* and many other places. Now to believe in God is to believe in him implicitly and inclusively, that he is mercifull and wise, and therefore can and will find out a means of redemption.

Lastly, What was the faith of the Patriarchs in the Old Testament, but an implicit or inclusive faith?

V. This accidentally, and now I go on to finish what belongeth to practick Faith: For observe, that Faith is either *contemplative*, which is a contemplation or bare knowledge of the precedent, present, and future state of man, and of a means of redintegrating his nature.

2. Or *Practick*, when we institute, that theory in action, which doth principally consist in applying its rules and Theorems to our selves in particular. Now Faith in general and absolutely implieth both in the same manner; as *Logick*, which is a practick Science comprehends theoretick Logick and practick Logick; the first being ordinarily called, *Logica docens*; the latter *Logica utens*; and so we may say *Fides docens*, and *Fides utens*.

The general practick rules of Faith are these:

1. *By such wayes and means, as are like to those (in matter, but not in form) whereby man fell into evil, man is to recover himself from it.*

2. *A man is to recover himself by insisting in the same way, but by contrary steps, and using the same means, but in a contrary manner.*

3. *This contrariety of insisting and use, is a conformity to the insisting and use of means of the first man before his defect.*

VI. Man fell first by omitting the contemplation of God, but for a few minutes, and by yeelding to his sensual appetite, and the perswasion of the evil spirit.

Pray observe here, that the condescending of the soul to the body was not a sinne: That being necessary; for how could man have eaten else? But the condescending of the soul to the body to a bad end, or so, as to be taken with the pleasures of it more than with its own, was a sinne and caused his fall, because the pleasures of the body, and those of the soul are contrary, the one expelling the other; if you take delight in the meditation of divine

divine things, then the pleasures of the body are laid aside; or if in them of the body, then God is put by. Again, pleasures or delights of the body, when the soul is habituated to them, turn into passions: As for instance, If a man takes delight in drinking, and often repeats that act, at last he will be besotted with a doting love upon it, so as he will scarce be content, but when he is a drinking. There are some men, whom it is no easie matter to find sober although betimes in the morning; they drink all day, and go drunk to bed; they awake in the morning half foxed, with their brains, yet dulled, scarce being cleared of the last nights intemperance: presently after they call for a mornings draught, and drink untill noon, then sleep all dinner time, and in the afternoon go to it again, and tipple untill night, and so drink they the whole year about; if at any time they are reprov'd for it, they will answer and swear to it, when ever they leave off drinking they shall die. The like turning to passion you may observe in all other pleasures.

VII. A man is to return by stepping backward out of the same wayes and means: as

1. Above all things he must bridle and constrain his passions, as love, anger, hatred, &c. for by these the soul is altogether smothered up.

2. A passion seldom ceaseth on a man, but it leaveth a cinder, so that it easily blazeth again.

3. A passion is abominable in God's sight: or nothing is more agreeing with the nature of Devils, than alwayes to be in a passion.

4. A man is no lesse justly taken for a beast, than so called in the vulgar language: as when a man is taken notice of to dote upon a thing, people compares him to an asse, and say, he is a doting asse: or when he is incensed with hatred, they say, he is as full of hatred or venom as a Serpent: or when he is inflamed with anger, they resemble him to the Devil, in saying, he is as angry as a Devil.

5. The greatest advantage, which the Devil ever takes of men, is in their passions. How many are there, that hang and murder themselves in wrath, love, sadnesse, &c? How many are there killed through jealousy, hatred, or anger?

6. One passion seldom ceaseth on a man without being accompanied

companyed with many other vices and finnes; in anger, love and hatred they are apt to lye, abuse, murder, and what not?

7. A passionate man is by wise men accounted a fool: For it was one of the tenents of the *Stoicks*, That no wise man was passionate; and a very true saying it is; for what foolish thoughts are men suggested with that are in love, sorrow, anger, &c? You may object, That it is wisdom to love God. I answer, That that love is no passion, because it lasteth: besides, it is a necessary property inhering in the soul, whereby it inclineth to God with all her faculties: therein she answereth to her end, for which she was created, which is to love God, or to be carried forth naturally to God. Neither is a Saints hatred against the Devil a passion, but a natural aversion from him. Compassion in a wise man is no passion, for it doth not alter him, it is rather a quality analagous to it, through which he succours a man in misery. A passion is violent, and not lasting; the fore-mentioned seeming passions are natural, and therefore lasting: So that a wise man cannot be a wise man, and yet passionate, because it perverts his reason, and detracts him from his meditations; and if at any time a wise man happens to fall into a passion, for that time he is no longer wise, but foolish, in declining towards his passions.

8. There is no passion but what is full of pain. All passions cause a violent alteration, which doubtlesse must prove painfull. Joy, which is supposed the best of passions, is painfull, it rendring a man restless, and full of anguish, not knowing where to bestow himself. The like may be attributed to Fear, Love, Anger, Sorrow, Hope, &c.

9. Passions are vain, fading away, and leaving no real good behind them. A man, when his passion is over, wondreth how he could have been drawn into such a passion. One that hath been lately in love with any thing, after a while, when that love to such an object is ceased in him, admireth at himself, how he could have loved it; and so of all the rest.

10. All passions, whether good or evil, are redoubled with sorrow and melancholly.

11. All passions are hurtfull both to soul and body: to the soul, because she thereby is taken off from her *Summum Bonum*:

to

to the body, because passions do dissipate or suppress the vital and animal spirits: whence we may observe, that a passionate man is seldom long lived.

12. A passion is a great sinne.

13. Most men are apt to shun others, that are passionate, or seem to be so. For we commonly say, I care not for such a one, because he looks like an angry, or spitefull man, or he looks like a doting fool.

14. Atheism is a collection of the habits of all passions in one man.

Wherefore it is necessary for a man, who endeavoureth to live eternally in happiness with his Creatour to wean himself from all passions whatsoever, and shun them, as being most detestable.

VIII. Secondly, Pleasures of the body are to be waved and contemned as much as possible: because by these man's soul was first drawn aside: Are we not apt to shun and be averse from any thing, that offended our bodies, or caused a sickness? Much more ought we to shun that, which cast our souls into a mortal disease. Pleasures of the body consist in the enjoyment of objects coveted by our sensual appetite: but these are beyond necessity, or more than our bodies require: for instance, to eat and drink of variety, or more than our natures require, is counted a pleasure: but that is beyond necessity: So that all pleasures are beyond necessity; Wherefore when we say such an one eats or drinks for pleasure, that is, he eats or drinks beyond necessity, or more than his nature requires. We must then also forbear going to see idle shewes or playes, for they rob our souls of her pleasure, and diverts her from contemplating her *Summum Bonum*.

Pleasures in the fore-mentioned sense differ from passions only (*Secundum magis & minus*) more or lesse, since that each of them, if often repeated may easily turn to a passion: how detestable they are hath been shewed already.

The pleasures of the body destroy both body and soul: their natural effects enervate our strength; their moral ones damn our souls.

Bodily pleasures belong only to beasts, as those of the soul to men: Let us not then be so foolish as to make an exchange. Pleasure

'sure is the Devils bait, whereby he sweetly draweth us to Hell. A bodily pleasure is also a great sinne,' because thereby we do not answer the end of our Creation: Had the first man not eaten more, than his nature required, or had he abstained from variety (both which being pleasures) he could not have sinned; but eating beyond necessity, he fell into a pleasure, and afterwards into a passion by repeating the same over and over again.

IX. Thirdly, You must resist the Devil with all your force, who, since you are fallen back from his party, will prove no mean enemy to you; and therefore

1. Consider where he intends to attack you, and be sure always to have a Sentinel abroad, who may give you a timely alarm, when he approaches for to make an assault upon you. Then, as a prudent Captain you are to know your strength, and view your whole Fort; first, where you are the weakest; 2. wherein your greatest strength lies, that so you may alwayes be in a readinesse of relieving your Fortresse. Besides, it will be a piece of prudence in you to know whence to procure assistance, if upon occasion you should be fiercely set upon. Your greatest weaknesse is in your out-works, which are your external senses, and some of your in-works, as your sensual appetite, and internal senses. Your greatest strength consisteth in your soul, namely in her reasoning faculty and will. Your aid and assistance is God, whom you are constantly to implore for succour and relief. Consider withall your enemies weapons, wherewith he intends to encounter you: And lastly, take notice of his strict discipline and policy in managing of his affairs, and therefore how much the more ought you to bestir your self, and look about you?

Now I will take leisure to unfold your weaknesse to all. There is never a sense, but it hath its weaknesse attending it.

1. The Eyes they are apt to be enchanted with shows and playes, and especially such as are obscene: Your Ears with immodest discourse: Your Taste with gluttony and drunkennesse: Your Sent with noxious perfumes: And lastly, your other Sense with lust.

All these are great and dangerous weaknesse. Are not some people so corrupt and slavishly tied to see shows and playes, that there is never a day, but they must see either a show, or a play;

play; they dream of playes; they do constantly talk of playes; and if there was but a fine show or play to be seen, the next discourse is, what have you not seen such a show, such a rare play? Now mark the Devils policy, there is never a tempting play or show, but the Devil sets it off either by casting a lustre upon their eyes, or a pleasantness upon the gestures, a splendour upon the habit, and a clangour upon the speech of the Actours: You cannot imagine how dead and simple a play would seem without the Devils vernishing of it; and this is evident, many having seen rare playes, upon whose eyes the Devils could not work, and to them they appeared as nauseous and simple, as it proved admirable and rare to others, upon whose eyes this glosse would take. The like may be said of painted or patcht faces; how strangely are they set off with a glosse upon some mens eyes, and how ugly they appear to others, whose eyes are incapable of a glosse. To these they seem like a picture, or a patcht thing made up by Art; like to a handsome doublet with a patch upon the elbow. And is not this a pretty stratagem of the Devils?

What a harmony doth an immodest tale strike upon some mens ears? O pray, say they, tell that once over again, it is one of the best that ever I heard! Do you not think that the Devil gives a little touch here to, to set off this melody? To others again it prooves a harsh discord: so that while men play thus upon the Organs, the Devil he blows the Bellows.

The Pallat or Taste is as ready to be enticed as any of the others. Pray listen to a Drunkards story; I was yesterday, saith he, at such a Tavern, and there I had my fill of the best Canary in Town, and yet my head doth not ach, a sign of its excellency; come, let us go, and have another taste of it. Surely the Devil did not neglect his opportunity in putting his paw into the cask to set off the wine with a relish; and when he hath caught a man in drunkenness, how doth he scruce blasphemy out of his mouth? How doth the Devil then ride him? leads him by the nose whither he list; it may be directs him to a ditch, and so he is drowned; or leaves him in a dead sleep in the high-way, and there he is robbed or murdered; or puts a sword into his hand to kill one or other, and so he comes to the gallows, and thence home; or sends him to a naughty house, and there he is infected with the Devils leprosie. How doth the Devil perfume womens looks to

enchant mens nostrils? or what a nicour doth he overshade their faces with to raise mens lusts?

As for the weaknesse of your appetite, it is not hidden, when you do every day feel its force and bending to evil objects: and lastly, how wickedly are mens thoughts for the most part imployed? In all these lieth your weaknesse, and there doth the Devil most attack you. Now then the defensive part of this military Art will lie in making your sallies upon the Devil, when you ever spie him moving towards you.

If your eye is enticed with any thing, shut it or look another way, go from it: and so do in the case of the other senses: For a retreat in these assaults is as honourable as a resisting. Do not willingly or wittingly runne into these temptations, for your strength is but weak at the strongest. If neverthelesse thou art *ex improviso* encountred by any of the fore-mentioned accidents, and that thou art forced to withstand a repulse, direct your thoughts to the *Summum Bonum*, and so undoubtedly you are *in salvo*.

Remember then that thou shunnest, contemnest, and goest back from all such objects, and persist in contemplating the *Summum Bonum* untill the last: for since the first man fell through waving this happinesse but for a moment, thou must surely lie open to thy enemies, and be devoured by them, if thou settest it aside. Think that all bodily pleasures are torments in comparison to the enjoyments of the soul.

X. Fifthly, We must return to our first operation of mind, which consists mainly, as I hinted just now, in contemplating God, and admiring his Attributes either immediately, or mediately through his wonderfull works: so that what ever object we behold, meditate or discourse of, we must behold, meditate, and discourse of it, as created from God, and having a mark upon it of his Omnipotence, Wisdom and Goodnesse. If we consider our selves, as first our bodies, we cannot but remark its admirable structure and variety of organs, one subserving the other, which revealeth God's Omnipotence and Goodnesse, and cannot but be a great happinesse, if we do but reflect, that this God, who is so Omnipotent, so Wise, and so Good is our God. When one heareth that another, who is his friend, and hath a kindnesse for him, is promoted to great dignity and power,

power, how is he rejoiced at it, because now he is assured he hath a friend in power? but how much the more ought that man to be transported with joy, who hath God for his friend, whose friendship and power is infinite beyond expression? Are we now so much astonisht at the formation of the body, what may we then be at the soul, by far exceeding the body? this consideration will be enough to carry forth a man into an extasie. So likewise there is nothing existent in the world, but its nature is so admirable, that we cannot but admire God in it.

Here you may take notice of the erroneous and hard opinion the vulgar harbours of those, that study Nature and natural bodies, meaning only Physicians. What do they say of them? They study Nature so much, that they imagine that all comes by nature. What a foolish saying? They would speak truer if they said, they study nature so little, that they imagine, that all things rise from themselves, and not from Nature. So that it is not the study of Nature, but the ignorance of it protrudes them to Atheism. I have likewise ever observed, that such, as asserted that blasphemy, were rash foolish fellows, having neither skill or learning in them. This is a more frequent ignorance among Chirurgeons, who thinking they know something, yet obstinately affect ignorance. What shall I say, are there not some among them, who have not thought it a crime to speak the greatest blasphemy of God and Christ, that tongue can expresse? Have the same Atheists spared of spitting out their venomous treason against their supream Magistrate and Countrey, although afterwards excusing themselves by pretending it was out of policy? The pestilence of these fellows breaks out in fiery heats, and botches in their butcherly faces. But God forbid all should be so, many of that Profession being as knowing and religious as of any others.

XI. Sixthly, We are to persist herein untill we are arrived to a compleat habit, for before we have attained to it, every evil act, although we have made some progresse, sets us very much back; yea sometimes renders us in as bad a condition, as we were in before: in the same manner as when we are a rolling up a great stone towards the top of a mountain, if we slip but a little, or do not continue in our strength and roll on, the stone tumbles down again to the bottom. Wherefore think that the least evil

act, which you commit, sets you back, and may endanger you of returning to your old condition; for as a stone inclineth naturally contrary wayes to the force of the driver, so do we naturally incline contrary wayes to the motion of the good that is yet remaining in us. Be sure then to persist and persevere in your labour, lest you do labour in vain. Let what ever you think, speak, or do, have a relation or a reflexion to God, and so you shall soon come to the top of the hill, where you shall have rest enough.

XII. If you perceive your strength begins to fail, which seldom is otherwise, then pray to God, and constantly implore his aid and assistance; for without it all our labour is labour in vain.

Here you may enquire, How one may know that God will be sought by prayer?

I answer, Nature doth shew us as much; for when ever misery doth surprize us, we do naturally, as if stirred through a necessary and forcing principle, call upon God: and what is Nature but God's intended work?

2. It is consentaneous to the nature of misery, for that needs relief and succour, which is no other way procured, than by zealous prayer: Possibly you may suggest to your self, that it is to be got by praising God. By no means God is not pleased with any praises, but of such, as are like to him; as for others, they are an abomination to him. Praising denotes a gladnesse or joy, which cannot be in any one, who is yet detained by his original misery. We must therefore desire God to help us in striving and resisting against all bodily pleasures and passions. I say strive; for we must labour hard, or else God will scarce help us. And this was not unknown to the worst of *Heathens*, as their common saying doth witnesse, *Dii laboribus omnia vendunt*. The gods sell all things for labour. When now you begin to feel your misery to be lessened, then praise God with all your heart, and with all gladnesse for his Mercy and Goodnesse extended towards you; and herein you are to abide for ever; for as God's Mercy is without end, even so must you continue in praises without end.

Lastly, Beg of God to illuminate your understanding, that you may understand all things more distinctly, thereby to admire

mire God the more. And now you do begin somewhat to resemble the first man in all his mental operations and felicities. But the body still remaining unclean, it is necessary for the soul to leave it for a while, that it may be purified through fire, with the rest of the Elements, and so be made a fit palace to receive the soul in again. The soul needs no purification, and therefore ascendeth directly to God's bosome. So that I do much agree herein, that there is a Purgatory for the body, but none for the soul.

XIII. Hereupon enquiry may be made, Whether the soul expiring out of the body, and carried to God if Good, (or to the Devil if evil) is to be an Angel, or to live with God for ever without any office : Or, Whether she is to be re-united to the body, when purified. It is probable, that the soul deserting the body is to be immediately an Angel, and to continue in office, untill such time, that the compleat number of souls have likewise finished their course. I prove it. It is improbable, that the soul should desist from serving God, and professing its duty, because she was created for the same end.

Secondly, Her condition would exceed that of Angels, were she exempted from all duty, these being also created for God's service : for Spirits are called Angels from their Office, which is to serve God. The word is derived from *ἄγγελος*, denoting a messenger, which again from *ἀγγέλλω*, I send. The Office, which the separated soul is capable of exercising, is of taking care of souls yet in the body, in helping and assisting them ; for as the Devil doth seduce us by depraving our appetites and fancies, so to the contrary do Angels enlighten our understandings, and suppress our immoderate appetites.

XIV. This office they shall remain in untill the consummation of the world, at which time every soul shall be re-united to its body now purified by fire, and transformed into a splendid substance. All the Elements shall then be sublimed into a pure nature, and all other things else shall return to what they were at the time of the first man's innocency. Beasts shall receive new natures, their wild ones shall become tame and obedient to man as formerly. The poisonous herbs shall be changed again into wholesome. All flowers shall re-indue their primitive fragrancy : Summarily all men, that shall escape the terror of that great day of judi-

cure,

ture, shall be placed in the same state and Paradise, which the first man enjoyed, and the same Law shall be imposed upon men, as before. Man shall abide eternally in Paradise: he shall eat and drink, but he shall not generate. The great instrument and cause of man's redemption shall eternally reign over him. Here I have described man's second Paradise; there remains only the proof of its particulars.

I. That the separated soul shall be re-united to its body, is apparent, because God created her at first with a natural propensity to the body, and that she should be a perfection to it, which propensity is yet remaining in her, because God doth not recall any thing, that he doth, or hath done. This propensity is a certain sign, that God will raise up its body again, otherways it would be in vain. The body ('tis likely) will be the same (*Quoad formam accidentalem & figuram*) according to its precedent form, shape and figure, because thereby the saved souls may know one another again, when they meet in Paradise, and rejoyce together, alwayes praising God for his mercy and goodnesse.

XV. The soul being now returned to its body, must be contained by a corporeal place. This corporeal place must be a Paradise, upon earth, because God did first bestow it upon man, as being agreeable to his integrity and perfection; and of the other side, as being consentaneous to God's infinite goodnesse, through which he conferred a compleat and entire happinesse upon man. The same now remaining, to wit man's perfection and God's goodnesse, it is certain, that he will conferre the same happinesse upon man, namely Paradise; because God in his wisdom finding it to be suitable to man then, will ordain the same again now, his wisdom being the same.

If God then is pleased to conferre the same Paradise upon man, it is evident, that all the Elements shall be purified, otherways how could it be a fit place for to imbrace so pure a substance? The same Law, 'tis probable shall continue, because the same obedience and duty will be required from man as before. Beasts, Herbs and Flowers the second Paradise shall abound with; because God judged it convenient before, and therefore his wisdom being unchangeable will judge the same then. He shall eat and drink, because otherways the fruits of Paradise, and mans nutritive

nutritive organs should be in vain. He shall not generate, because the number of men will be compleated. The caule and instrument of our Redemption was an entirely righteous and essentially holy man; yet more than a man, for it was impossible, for man alone to satisfie God's justice: since then the chief instrument of our salvation was a man, his body being of the same nature with others, must require a corporeal place: but of this little can be said, since man through his reason cannot dive unto it, neither is it revealed, unlesse obscurely.*

What shall I say more to you, O, that most splendid second Paradise, abounding with innumerable springs of ineffable joys! This is the Palace, whither the *victorious Soul* shall be conducted by a number of glorious Angels to the greatest of Kings, attended by myriads of *Cherubims*, there, in the sight of them all to receive the Laurel, and to be installed into an everlasting dignity, office, and possession. Thence she takes her place among those illustrious attendants, and sings Hymns to the melodious ear of the chief Musician. O hear their sweet noisering, *Gloria, Gloria Deo in excelsis. Te Deum laudamus in aeternum*. O the harmony of their quavering wings and smooth voices! O the glorious order in their moving! O the splendour that encompasseth them! O the glistering of their appearances! O those bright Stars moving swifter than the Heavens! O the clustery descent of the myriads of *Seraphims*, then of *Cherubims*, and of *Thrones*! O but what misery is it to be shut out from this celestial consort, and have ones brains dashed against the fiery pins, and burning stakes of Hell? Wo the most horrible sight of that monstrous Arch-devil *Satan*, piercing the most tender sinews of man with his serpentine tongue, haling each limb of him with so many Drakes heads: scrueing his conscience, by trusting his eyes into that dread magnifying glasse of Hell, which serveth him to shake his shattery bones, through seeing the monstrous greatness of his sins. Wo that multiplying Glasse expressing the vast number of his detestable wicked deeds. Wo the fearfull thunder of those innumerable legions of wretches roaring out through the most intollerable pains of their sinews, the rigid torments and the gnawing, fretting, distracting, inflaming Gangrene of their sad consciences. Wo the everlasting pricking, pinching, convulsion, rotting of their sinews. Wo the deformity of their

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ulcer'd,

* A description of the second Paradise you may also read in Isa. 65. 17, 18, 19, &c. and in the next ensuing Chapter. 2 Pet. 3. 13 and in the 21, and 22 Chapter of the Revelation.

ulcer'd, swelled, rankled bodies. Wo the fearfull spectacle and disorder of hellish monsters! here is a fiery Serpent, there a roaring Lion, here stands a dreadful Drake formed out of the body of an Atheist, there a raging Crocodile grown up out of the body of a Traitor. Wo the unexpressible innumerable torments and dreads of Hell.

And this you see is the end of Good and Evil, and of this Treatise.

CHAP. XXII.

Comprizing a brief account of the Religion of the Heathen Philosophers.

- I. Soerates his belief of God.
2. What God is according to Homer.
3. What Plato thought God to be.
4. Thales his saying of God.
5. Instances proving the Heathens to have known Gods Attributes; particularly, That Thales believed God's Omniscience, and God's unchangeable Decrees.
6. That Socrates asserted God's Omniscience, Omnipotence, his creating of the world in time, his justice and mercy, God's Omnipresence.
7. The Articles of Plato's Faith,
8. Aristotle's Belief.
8. Virgil's opinion of divine things.
10. The divine Song of Orpheus,
- II. Trismegistus upon the Creation of the world.

After the proposal of a Rational Divinity, and its evidence through humane Reason, it will not a little conduce to the proof thereof, that Heathens have through the light of Nature attained to the same.

I. Socrates, who might more justly be surnamed *Divine*, than his Scholar *Plato* (who received most of his learning from him) constantly

constantly used to say, *That the only amiable wisdom was to know and understand God and Nature; which knowledge (saith he) was not begot in men, but it was called to mind; as if he would have said, the soul must needs retain some impression from whence it was derived. He asserted also, That the supreme God was the Father and maker of all things.*

II. *Homer declared God the Father of all the gods which are created, and maker of beasts, and all other things that had no souls. By gods here he meant men, who for their excellency of wit and parts, were after their death remembered with sacrifices, and honoured with the name of gods. Neither did men really take these for gods, but only in the same manner as Papists do their Saints; for they were not ignorant that these had been men, and could then perform no more than men. Hence Heraclitus affirmed, That this world was not made by any of the gods or men.*

III. *Plato his assertion was, That God of all causes was the most excellent, and the first.*

IV. *God, saith Thales, is the most ancient of things, for he never had beginning or birth.* Stob. Serm. 109.

V. Now I come to produce, that they had attained a particular knowledge of God's Attributes.

Thales being demanded, whether a man might do ill and conceal it from God: no nor think it, said he.

Stobaeus relates of *Thales*, that he being asked what was the strongest, answered Necessity, for it rules all the world. Necessity is the firm judgement and immutable power of Providence, A golden saying inverting Fate into God's unchangeable Decree.

VI. *Socrates* his knowledge of God was after this tenour: viz. *Xen. Mem.*

"That God knoweth all things, said, done, or silently de- 1,4.
"fired.

"That God through his care sustains all his creatures, in providing light, water and fire for them. But particularly for man,
"for whose service and subjection he hath ordained plants and all
"other creatures.

"That God is one, perfect in himself, giving the being and well-being of every creature; what he is I know not, what he is not I know.

"That the way to true happineſſe is Philoſophy, whoſe precepts are two, to contemplate God, and to abſtract the ſoul from corporeal ſenſe.

"That God, not Chance created the world and all creatures, is evident, through the reaſonable diſpoſition of their parts, as well for uſe as defence, from their care to preſerve themſelves, and continue their kind: That he hath had a particular regard to man in his body, is no leſſe apparent from the excellency thereof above others; from the gift of ſpeech, from the excellency of his ſoul in Divinations, and fore-ſaying dangers: That he regards particular beings, from the care of their whole kind: That he will reward ſuch as pleaſe him, and puniſh others that diſpleaſe him, from his power of doing it, from the belief he hath ingrafted in man: That he will do it: That he is profeſſed by the moſt wiſe and civilized Cities and Ages: That he at once ſeeth all things, from the inſtances of the eye, which at once over-runs many miles; and of the mind, which at once conceiveth things done in the moſt remote places: Laſtly, That he is ſuch, and ſo great, as that he at once ſeeth all, hears all, is every where, and orders all.

Plat. de Repub. l. 6. Plato maintains, "That God is incorporeal and an unchangeable Light. That the knowledge of God was the true wiſdom, and that we are render'd like to God through our juſtice and holineſſe.

Lib. de Re- lig. c. 9. What ſaith *Auſtin* concerning *Plato*? "That his followers would have been Chriſtians, a few words and ſentences onely being changed.

Phad. "That the greateſt happineſſe conſiſted in knowing God, and in being like to him.

Juſt. Mart. orat. Parænet. ad Gent. But poſſibly you may reply, That *Plato* (according to what is aſſerted by *Juſtin Martyr*) had read ſome Books written by an inſpired pen, as the Books of *Mofes* and the Prophets. Unde *Plato* (*inquit*) *currum volentem Jovem agere in Cælo didicit, niſi ex Prophetarum Hiſtoriis, quas evolverit? Intellexit enim è Propheta verbis, qua de Cherubim ita ſcripta ſunt, & gloria Domini ex domo exiit venitque in Cherubim, ſumſerunt Cherubim pennas ſuas, & rota eorum cohærebant, Dominique Dei Iſrael eſt in Cælo cohærent gloria. Hinc profeſſus Plato clamat his verbis:*

Magnus

Magnus in Cælo Jupiter currum volentem incitans ; alioquin à quo alio nisi à Mose & Prophetis hæc didicisset ?

“Whence (saith he) had *Plato* learned that *Jupiter* rid in a flying Chariot, but out of the Histories of the Prophets, which he had over-lookt? for out of the Books of the Prophets he understood all those things, that were thus written concerning the *Cherubims*: and the glory of the Lord went out of the house, and came to the *Cherubims*. The *Cherubims* took their feathers, and they hung together in circles, and the Glory of the Lord of *Israel*, did abide upon them in Heaven. Hence *Plato* descending cries out these words: “*Jupiter* great in the Heavens driving his flying Chariot. Otherwise from whom should he else have learned these things, but from the Prophets?”

And so *Clem. Alexand. lib. 1. Strom. orat. ad Gent.* speaking as it were to *Plato*. “*Leges, quæcunque vera sunt, tibi ab Hebræis suppeditata sunt.* What ever true Laws thou hast set down are supplied thee by the *Hebrews*.”

To this I answer, That it is very improbable, that *Plato* should have collected his Divinity out of *Moses* or the Prophets, their writings being in his time not yet translated out of the Hebrew. I should rather believe with others, that he had sifted his divine Notions out of *Hermes Trismegistus* an *Egyptian*, who according to *Snidas*, flourished before *Pharho*, and was called *Trismegistus*, because he had through a divine inspiration written of the Trinity. And *Sugul.* saith, that he was called *Ter optimus maximus*, the thrice best and greatest, because of his greatest wit, or according to others, because he was a Priest, King, and a Prophet.

’Tis not only thought of *Plato*, that he had gathered some riddles of God from the *Egyptians*, but also of *Theodorus*, *Anaxagoras*, and *Pythagoras*. But I continue *Plato*’s sentences.

“The body being compounded is dissolved by death, the soul being simple passeth into another life, and is incapable of corruption.” *Plat. Phad.*

“The souls of men are divine, to whom, when they goe out of the body, the way of their return to Heaven is amicably open, for whom to be best and most just is most expedient.”

“The souls of the good after death are in a happy state, united to God in a blessed inaccessible place; the wicked in convenient.” *Plat. Phad.*

"ent places suffer condign punishment. But to define what those places are, is ἀπορώμεν μὴ ἔχοντες : Whence being demanded, what things were in the other world? he answered, Neither was I ever there, or ever did speak with any, that came from thence.

VIII. We must not forget *Aristotle*, who *lib. 3. de anim. c. 3.* closes with *Homer* in these Verses.

Τὸ δ' αὐτὸ βέλεται τέτοισι καὶ τὸ δ' Ὀμήρου,
Τότος δ' ἄνδρες εἶν' ἐστὶν ἄνθρωποι ἀπορώμεν
Οἷον ἐν' ἡμεῖς ἀγνοοῖμεν τὰ τῆς ἀψόφου διαρτε.

And *Homer* agreed in the same, That the minds of mortal men were such as the Father of Gods and men did daily infuse into them. Moreover *lib. 1. de anim. cap. 3. r. 65, 66.* he calleth our understanding Divine, and asserts it to be without danger of perishing. And *lib. 2. de gener. cap. 3.* delivers his sense thus, καὶ πᾶσι δὲ τῶν νῦν μόνον διέχοντες ἐπιπνέμεν καὶ θεῶν εἶναι μόνον, οὐ δὲ δ' αὐτὴ τῇ ἐσθ' ἡμεῖς κοινῶν σωματικῇ ἐσθ' ἡμεῖς. Wherefore it remains, that the mind alone doth advene from without, and that she alone is Divine; for the action of the body hath not at all any communication with her action.

IX. *Virgil* 4. *Georg.* wittily sets down God's ubiquity,

— Deum namque ire per omnes
Et terras tractusque Maris, Cælumque profundum.
Hinc pecudes, armenta, viros, genus omne ferarum,
Quemq; sibiennes nascentem arcessere vitas.

Et 6. *Aeneid.*

Principio Cælum, ac terras camposque liquentes,
Lucentemq; Globum Luna, Titaniaq; astra.
Spiritus intus alit totamq; infusa per artus
Mens agit at molem, & magno se corpore miscet. That is,

For God doth go through all the earth, the tracts of the Sea, and the deep of the Heavens. Hence do beasts and men and what ever is born draw their thin breath.

And in the sixth Book of his *Aeneids*.

In the beginning God created Heaven and Earth, and the melting fields, and the shining Globe of the Moon, together with

with the Titanian Star. A spirit doth nourish it within (speaking of the world) and a mind being infused through its members doth move its mole, and mingles its self with that great body.

X. The admirable Poësie of that Divine *Orpheus*, lib. de *Mundo*, is worth our observation.

Ζεύς πρῶτος ἔσχατος. Ζεὺς ὅσαυτ' ἀρχὴ καὶ τέλος.
 Ζεὺς κεφαλὴ, Ζεὺς μεσση. Διὸς δ' ἐκ πάντα τέτυκται.
 Ζεὺς πνεύμα γένετο, Ζεὺς ἀνέβη ἀπὸ τοῦ Νύμφης.
 Ζεὺς πνοὴ πάντων, Ζεὺς ἀρχὴ καὶ τέλος.
 Ζεὺς πᾶσι βασιλεὺς. Ζεὺς ἥλιος ἡ δ' ἀστὴρ ὅλος.
 Ζεὺς βασιλεὺς. Ζεὺς ἀρχὴ καὶ τέλος ἀρχὴ καὶ τέλος.
 Πᾶσι βασιλεὺς. Αὐτὸς ὁσος ἐς πολὺν οὐρανόν.
 Εἰς ἑρῆς καὶ δὴς ἀνέβη καὶ μέγιστος πέφανται.

Jupiter is the first, *Jupiter* is the last. *Jupiter* is the head, *Jupiter* is the middle.

God made all things. *Jupiter* is the foundation of the earth, and of the starry heavens.

Jupiter is a male, *Jupiter* is an immortal Nymph.

Jupiter is the spirit of all things, *Jupiter* is the mover of the unruly fire.

Jupiter is the root of the Sea. *Jupiter* is the Sun and the Moon.

Jupiter is a King. *Jupiter* is the fulminating Prince of all, for he covereth all, he is a light to all the earth, out of his breast he doth wonderfull things.

XI. *Trismegistus* lib. 1 *Pimandr.* renders himself very divinely. "The mind of the divine power did in the beginning change its shape, and suddenly revealed all things, and I saw that all things were changed into a very sweet and pleasant light. And below in another place: "A certain shadow fell underneath through a thwart revolution. And *Serm. 3. Pimandr.* "The shadow was infinite in the deep: but the water and the thin spirit were in the chaos: and there flourished a holy splendour, which impelled the Elements under the sand and the moist nature, and the weighty bodies being submerst under the darkness did abide under the moist sand.

Empedocles defined God a sphere, whose center is every where, and circumference no where. *Vincent in spec. hist. l. 4. c. 44.*

Pythagoras.

Lactant.
l. 1. c. 5.

Pythagoras described God to be a mind diffused throughout the universal parts of the world, and the whole nature, out of which all living creatures that are born, do draw their life. In another place he calls him *ψυχον τὸ παντός*: *The soul of the universe.*

Arist. l. de
par. animal.
c. 5.

Heracitus being at a certain time of the winter crept into a Cottage for to warm himself, and being enquired for by some, who were ashamed to come into some a place, called to them to come near; for (said he) *the gods are also to be found here.*

Athenagoras an Athenian Philosopher expresseth himself very profoundly: God (saith he) *bath given man a judgement of reason and understanding for to know intelligible things, the Goodnesse of God, his Wisdom and Justice.*

ERRATA.

P Ag. 4. lin. 6. read of their. l. 31. wisdom it self. p. 6. l. 8. r. with those. p. 8. l. 17. r. those. l. 25. r. into good. p. 13. l. 19. r. wherein. p. 15. l. 12. r. into that. l. 28. r. according to. p. 17. l. 29. r. those of the. l. 35. r. these causes. p. 22. l. 33. r. a man doth. p. 25. l. 32. r. impose. p. 26. l. 16. r. What is. p. 32. l. 26. r. ~~weight~~. p. 35. l. 20. r. latter. p. 41. l. 34. dele it. p. 63. l. 32. r. and exciting. p. 71. l. 18. dele it. p. 73. l. 27. r. others. l. 29. r. Immodesty. l. 35. r. ~~ells~~, weights. p. 75. l. 22. r. eternal. p. 90. l. 2. r. ~~Permatick~~. l. ult. dele also. p. 94. l. 14. r. coactè. p. 95. l. 16. r. forbidden. p. 98. l. 11. r. attribui.

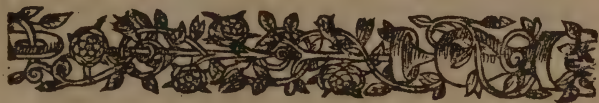
FINIS

Archelogia Physica Nova.
OR
NEVV PRINCIPLES
OF
Natural Philosophy.

The SECOND PART.

The First Book.

By GEDEON HARVEY, D^r of *Phys.* and *Phil.* Late Physician to His Majesties Army in *Flanders*.



L O N D O N,

Printed by J. H. for S. Thomson,
at the Bishops Head in S^t Pauls
Church-Yard, 1663.

THE NEW ENGLAND
PHILOSOPHY

By JOHN WILKINS, Esq.
OF THE UNIVERSITY OF CAMBRIDGE

LONDON:
Printed by J. Streater, at the
Sign of the Gun, in St. Dunstons Church-yard, 1667.

Book I



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Natural Philosophy.

The SECOND PART.

The First Book.

CHAP. I.

Of the Nature of Natural Philosophy.

1. *The Etymology and Synonyma's of Natural Philosophy.*
2. *The Definition of Natural Philosophy.*
3. *An Explanation of the said Definition.*
4. *What a Natural Being is.*
5. *What a Natural Essence is.*
6. *What Nature is.*
7. *The various Acceptions of Nature.*



Natural Philosophy is so called, because it treateth of Nature, and Natural Beings. It is also known by the name of *Physicks*, which is derived from *φύσις*, Nature. Aristotle in his *Metaphysics*, Book 6. Chap. I. calleth it the second Philosophy. Cicero in his Book of *Divin.* nameth it *φυσιογνωσία*, that is, a Discourse of nature.

II. *Natural Philosophy* is a Knowledge of a Natural being.

III. This Definition stateth a Natural being to be the Subject of *Physicks*, which is somewhat restricted from a being in general, as being less universal, and therein it is distinguished from *Metaphysics*, where a being is discoursed of, as a most universal Entity; but here, as a less. *Natural* in the Definition doth lay a restriction upon a being, and giveth it a specifick consideration; and therefore it proves frustraneous to add (*quatenus naturale*) *as far as it is natural*: for otherwise, what need would there be to appose *Natural*, did it not imply the same? Or in case you omit *Natural*, you may define natural Philosophy to be a knowledge of a being so far as it is natural, and so it is the same again. Here you may take *Astronomy* to be coincident with *Physicks*, because it treateth of the Heavens, which are natural beings. Herein I do resolve you thus: *Astronomy* is not a knowledge of the Heavens; for a knowledge doth explain a thing through its Causes and Affections: but *Astronomy* doth not treat of the Causes of the Heavens; wherefore it followeth that *Astronomy* is not a proper Science of the Heavens. Although *Astronomy* containeth the Doctrine of the Motion of the Heavens, which is only an Affection or Property of the Heavens; yet therein it doth not constitute a Science, unless in an improper, although usual signification, wherein Science is taken for any kind of Knowledge, be it of the Causes, or Affections of a thing; be it Theoretick, or Practick; and according to this Acception is the *Art* of *Grammar* frequently called a Science. *Astronomy* is a partial Science, or it is a part of the Science of *Physicks*, as discoursing of one of the affections of a natural being, which is the Motion of the Heavens. But since each of these partial Sciences, if treated of all in one Volume, would grow to a vast Mole, Philosophers do therefore handle them in several Books, and Treatises.

IV. A Natural being is that, which consisteth of Nature, or which hath a Natural Essence.

V. A Natural Essence is that, which consisteth of Natural parts; namely, natural Matter, and natural Form.

VI. Nature is a disposition of an Elementary being, whereby it doth act according to its truth.

I say it is a Disposition, and therefore no power, because all dispositions are Actual.

VII. Nature is variously taken. 1. For a single Essence, exempted

empred from all Composition, according to which sense God is only called Nature; and for to distinguish his Nature from others, he is called (*Natura Naturans*) *Nature naturating*; or nature, which giveth nature to all other natures. 2. It is also taken for a derived being, which is distinctly specified by (*Natura Naturata*) *Nature naturated*; or for nature, which hath obtained its nature from the naturating nature. 3. For the Quiddity and Essence of a natural being; and according to this last acception it is to be taken here.

As God alone is called Nature according to the first acception, so are Angels and Soules, that are separated from their Bodies, called in a sense common to Elementary beings, Nature. But Nature in the third signification is only appropriated to Elementary beings.

I omit the mentioning many other Aceptions of Nature, because they are inclusively contained in these before-mentioned.

CHAP. II.

Comprehending an Explanation of the Definition of a Natural Being.

1. *What is meant by disposition.*
2. *An Objection against the Definition of a Natural being Answered.*
3. *What it is to act according to Truth.*
4. *That the Subject of this Science is more properly named a natural Being, than a natural Body.*
5. *Aristotles Definition of Nature rejected by several Arguments.*
6. *That Nature is a property of a Natural being.*
7. *The difference between Nature and Art.*
8. *That Nature in respect to God acteth constantly for an End.*
9. *The Division of Nature.*

I Come now to explain the Definition of Nature, which Explanation is the more necessary, because through its obscurity many

many doubts, and mistakes might otherwise be occasioned.

The *Genus* is a Disposition or Vertue, which you are to take here in a concrete consideration, according to the sense expressed in the Third Chapter of *Powers*. By vertue I intend an actual strength and power of acting, as it is inherent in a natural subject.

II. Against my Definition may be Objected, That Nature is a Substance: but a Disposition or Vertue is an Accident: Therefore it cannot be the right *Genus*. To this I Answer, That Vertue is a Property of a being, not really distinct from it, but modally only: now since we can only know a thing by its Modes, as doth appear in my *Metaphysics*; therefore beings for the understandings sake are to be explained by them, and are to be taken to be the same really with their subject. A Disposition then is the same, as if I had said a Subject, or being disposed and powerful.

Through Elementary being is meant, a being constituted by the Elements; wherein I do distinguish natural beings, as they are the subject of this Science, from the nature of Angels and separated Souls, which are immaterial, and not constituted through the Elements, as *Origen* did falsely suppose.

III. To act according to its Truth, is to act conformably to the Divine purpose and *Idea*, whereby beings do act the same, and are the same, which God did purpose they should act, and intend they should be: To be the same being, is to be that, which they are, and act that, which they do act; Where observe, that nature is the Seal and Impression of Gods Will and Omnipotence upon every being, through which they are that, which they are. Hence Nature is called the Hand of God. Hence it is also called the Order and universal Government among all natural beings, through which one being doth depend upon the other, and is useful and necessary to the other. This is evident in many moving living Creatures, as most Cattel, whose dependance and Preservation is from and through Vegetables; as from Herbs; theirs again is from the juyce of the earth; and that from a mixture of all the Elements. The same subordinate use and good is also observed among all other beings in the world. Hence nature is called the strength and vertue of a being; for their strength and vertue is nothing else but an actual disposition and propension in beings; In this sense we say the nature of fire is to levitate, of earth to gravitate.

IV. I did rather chuse to say a natural being, then a natural body,

for

for to avoid an impropriety of speech ; because a body is properly and ordinarily taken for matter ; and so we usually say, that man consisteth of a Soul and body, and that a natural being consisteth of a form and body, or matter. Neither is it a motive, rather for to say a natural body, then a natural being : because a being is of too large an extent ; for a being is restricted from that Latitude of signification by adding natural.

V. After the exposition of this Definition of nature, it will not be amiss to compare that of *Aristotles* to it. Nature is the Principle of Motion and rest of a being, wherein it is existent through it self, and not by accident.

It was the Opinion of *Aristotle*, that nature was a substance, and nevertheless here he seemeth to make an Accident of it ; for that, which acteth immediately through it self, is not a substance, but an Accident, because according to his dictates, a substance doth not act immediately through it self, but through its accidents ; if then a natural being acteth through its nature, that is, its Matter and Form, then nature must be an accident, and consequently matter and form are also accidents, which he did in no wise intend.

2. Suppose that nature were a substance, it would be absurd to assert, that a natural being did act through a substance of rest and motion, which doth inhere in it self ; for then there would be a penetration of bodies, and an Identification of Subsistencies.

You may reply, That nature is not a substance of motion and rest, but a substantial Principle. Pray, what is a substantial Principle but a substance ?

3. It is plainly against the Principles of *Aristotle*, to say, that a Principle is no substance ; for Matter and Form are Principles, but these he granteth to be substances.

4. If again granted, that these are substances, and not virtues, then it must necessarily follow, that a Form being an active Principle, doth act through it self, and thence a Form is called active. It must also follow, that Matter, which is another Principle of motion, acteth efficiently withal, because motion proceedeth from an Efficient or from a Form, and wherefore is Matter then called a passive Principle ? Your Answer to this will be, that Matter is not the Principle of Motion, but of Rest. I take your Answer, but what kind of rest do you mean ? Is it a rest from local Motion, or a
rest

rest from Alteration, or Augmentation? It must be a rest from some of these three. It cannot be a rest from local motion, because all beings are not capable of a rest from local motion: then it must be a rest from alteration, or augmentation. Neither can it be a rest from any of these; For all beings are constantly and at all times in alteration, and consequently are either augmented, or diminished. What rest can it then be?

It is no rest from Action, for then matter could be no Principle or cause, for all causes do act.

5. How can Matter and Form, which are Principles, before their union, be substances, since that a substance is a perfect being, which doth subsist in unity through it self, and thereby is distinct from all other beings: but matter or form can neither of them subsist through themselves, or have any unity, or distinction.

6. A Form is not a Principle of rest in all natural bodies through it self, but by accident: for all bodies are through themselves continually in motion, as will further appear in its proper place.

VI. Wherefore for to avoid all these Absurdities, Contradictions, and Improprieties of Speech, it is necessary to assert;

1. That Nature is a Property of a natural being, through which it acteth.

2. That a Property is really Identified with its subject, and consequently, that Natural is not really differing from a natural body. This property denotes a propension, or actual disposition, through which the said body is rendred active. By activeness I understand whereby all is constituted, whatever is actually inherent in a being, as, Existence, Subsistence, and all its other Properties; so that Nature or Natural in *Physicks* is a Property equivalent to the Modes or Attributes of Truth, and Goodness in *Metaphysics*.

VII. Nature differeth from Art, in that she acteth conformably to the Divine *Idea* or Intention, but Art acteth conformably to the intellectual *Idea*: Wherefore nature is infallibly immutable, constant, perpetual, & certain, because it dependeth from an infallible, immutable, constant, perpetual, and certain Cause; but Art is fallible, changeable, inconstant, and uncertain, because it dependeth from the humane Intellect, which is fallible, changeable, inconstant, and uncertain. As man is incapable of acting without God, so is Art incapable of effecting any thing without Nature. Nature is infinitely beyond Art: What Art is there, which can produce the

great

great world, or any thing comparable to the little world? Whatever excellent piece a man doth practise through Art, it is no further excellent, then it is like unto Nature; neither can he work any thing by Art, but what hath nature for its Pattern. What is it a Limner can draw worthy of a mans sight, if natural beauties are set aside?

VIII. Whatever nature acteth, it is for an End and Use: It is for an end in respect to God, who created all things for an end; it is for an use, in respect to one another, because all beings are useful to one another, as I have formerly demonstrated: but we cannot properly say, that all things act for an end in respect to one another, because that, which doth act for an end, is moved by that end, and doth foreknow it; but natural beings do not foreknow their ends, neither are they moved by them.

IX. Nature is either universal, or singular.

An universal nature may be apprehended in a twofold sense.

1. For the Universe or whole world, containing all singular natures within it. 2. For a nature, which is in an universal being, and so you are to take it here.

A Singular nature is, which is inherent in every singular and Individual being.

I do willingly pass by other Observations concerning Nature in general, because I have touched many of them in my *Metaphysics*.

CHAP. III.

Of the Principles of a Natural Being.

1. *That Privation is no Principle of a Physical Generation, or of a Physical Being. That Union might be more properly termed a Principle, than Privation.*
2. *The Principles of a Material being stated by Pythagoras rejected.*
3. *That to treat of Matter and Form is more proper to Metaphysics.*
4. *That the Materia Prima of Aristotle is a Non Ens.*
5. *That the Chaos had a Form.*
6. *The Authors Materia Prima.*
7. *That it doth not appertain to Physicks to explain the nature of the first Matter.*
8. *What the first Form of all natural beings is.*

I. **I**N *Metaphysics* it is made known, that all created beings consist of Parts, and that no being, except God alone, is single, but all are compounded. This is also proper to a natural being, whose composition is to consist of Matter and Form. I need not tell you the diversity of Opinions among Philosophers upon this Particular, they being fully related by *Aristotle*, in his Physical *Auscultations*; wherefore I shall only examine his, as being thought the most Authentick by modern Philosophers. The said Philosopher states three Principles, which do necessarily concur to the Production of a natural being: namely, Matter, Form and Privation. As for two of them, no doubt, but they are principles, but the third is disputable. Privation is *Logical*, that is, it is imaginary, and assigned to a being by a second intention of the mind, and therefore his Commentators do generally teach, that it is to be counted no other then a principle *per accidens*. If *per accidens*, it is no part of a being: if it is any thing, it is a part of Generation, for this doth immediately presuppose a privation; but a being presupposeth it immediately only, through, and by means of Generation. If they call that a principle of Generation, which doth necessarily concur to the constitution

constitution of a natural being, then that should rather be termed a principle, which doth concur to it *per se*, as for Instance, union. Union doth necessarily and *per se* concur to the generation of a natural being, but privation doth only concur to it *per accidens*.

Union is not only necessary at the moment of Generation, but also after a being is constituted; it is that, without which a being cannot consist. So that I say, that union is infinitely more proper to be termed a principle than privation, and why did not *Aristotle* dream of that? To speak properly, neither of them can be taken for a Principle of a natural being, whereby it should be constituted to be that which it is. Union is unnecessary, because unity doth imply it; since then that all beings are metaphysically constituted by an unity, which can be also applied to *Physicks*, it is needless to mention union in this Science, otherwise we might *quo jure* refer all the Modes of a being to it.

I much strange, why *Aristotle* omitted the inserting *Privation* in *Metaphysics* among the universal causes of an universal being, and why he did not as justly refer it to that part of Philosophy, as he did *Matter* and *Form*; it being of as large an extent and universality, as either of these. Possibly you will deny it to be of an equal extent with them, or assert, that it is of no larger universality than a natural being is. Herein I deny your denial and assertion; for it is of a larger extent than a natural body is, since it is applicable to Angels, and Devils, who must as necessarily have had a privation for a principle of Generation as Naturals, for even they were not before they were. Wherefore since he referred Angels and Devils to *Metaphysics*, he ought *quo jure* to have placed privation in the same Rank. The same Argument I may use against his eight Books of *Physicks*, there being little else contained in them but what is as common to spiritual beings as to corporeal; as for Instance, Time, Finiteness, Motion, &c. all which are common to immaterial beings. Wherefore had *Aristotle* treated of these Particulars in his *Physicks*, *Doctrina gratia*, it might have deserved an excuse, but since he treated of them there *per se*, it can be accounted no less than an Error.

II. *Pythagoras* taught a Trinal Number of Principles, constituting a material being. 1. A Point. 2. A Line. 3. A *Superficies*, or Surface. These are rather sorts and kinds of quantity, which for that reason do more properly appertain to *Metaphysics*; for

besides these, there are many others concurrent to the constitution of a material being, as hath been disputed of elsewhere. Yet this is observable in this Opinion, that *Pythagoras* and many other wise men did collect the principles of a being, by means of their senses; for it is in vain to talk of Essences and Forms, in such a manner as *Aristotle* did, which a man cannot apprehend, what they are; and for this reason he stated three principles of a material body, because these three could be evidently perceived by sense.

III. To treat of Matter and Form doth rather belong to *Metaphysics*, because they are principles remote from physical bodies; I say they are remote, because they are applied to natural bodies by means of the Elements: for natural bodies consist of Matter and Form, so far as they consist of the Elements, and the Elements are really and properly the Matter and Form of a natural being. Now, in every Science the *Principia proxima* are only to be treated of, for otherwise you might draw all *Metaphysics* to this Tract. *Aristotle* did erroneously discourse of these things in *Physics*, since he had treated of them in *Metaphysics*. My purpose was no other then to rehearse these matters for an Introduction, and to shew the mistakes of others herein.

IV. Matter in a natural being is either first or second. The first matter is, which is not produced out of any other, and therefore is termed to be ingenerable and incorruptible. The second matter is, which is produced out of the first, and is said to be generable and corruptible. *Aristotle* in his 1 *Book of Phys. C. 9. T. 82.* defineth the first matter to be the first Subject of every thing, out of which remaining, a being is generated through it self, and not by accident. The ancient Philosophers could hardly understand, what this first matter was, because of its difficulty; wherefore *Aristotle* himself was forced to describe it negatively, in the 1 *B. of Metaph. Ch. 3. T. 8.* The first matter is that, which through it self hath neither essence, nor quantity, nor any thing of that, by which a being is determined: which is as much as if he said, I know better what it is not, then what it is; and this kind of knowledge is common to Fools and Wise men. So that from this Description we may collect, that it is not cognoscible, since it is not determined, and consequently it is nothing. Notwithstanding *Aristotle* recollects himself in his *Physics*, where we have the forementioned Definition set down. The first matter, saith he, is the first subject of every thing:

thing : *Ergo* every thing is generated out of the first matter : How can that be? Then it followeth, that every natural being, when it is dissolved, is dissolved in its first matter ; or, how can the next being be generated out of it else? This most of his Followers do deny, affirming the contrary, *viz.* That a natural being through its corruption is not dissolved into the first matter. This they prove by *Aristotle* his own Dictates ; the corruption of one being is the generation of another. Generation, saith *Aristotle*, is in an instant : that is, as soon as one form goeth out, at the same instant, another enters.

2. If a being in its dissolution is dissolved into the first matter, then it must be deprived from all its Accidents : but we observe the contrary, for when a beast dieth, there still remain Accidents in that body : *Ergo* a being is not dissolved into the first matter. This moved *Aristotle* to assert the forementioned Theóremes, to wit, That Generation is in an instant, and that the corruption of one being is the generation of another, because there are Accidents remaining at the same instant, when the precedent form is expelled ; which Accidents remaining, do necessarily suppose a form, from which they are depending. All which infers, that every thing is generated out of the second matter, and not out of the first. How then can *Materia prima* be said the first subject of every thing?

The other part of the Definition is, out of which a being is produced : this is no less strange then the other. How can a being be produced, and yet the first matter be remaining ? For as soon as a being is produced, the first matter is not remaining, but it is now become a second matter with Accidents, which were not in the first.

V. It is more then probable, that naturally and really there is no such first matter.

1. Because all natural beings are generated out of a pre-existent Matter ; this our sense doth testify ; as for *Aristotles* first matter, that hath no Existence, but an imaginary Essence only.

2. All, that which doth really exist, is a compounded being. If there is any such single matter, how do you know it ? Sense never perceived it, how can you then tell it ? Whatever doth exist, or did ever exist, it hath, or had a Form. You may say, that the *Chaos* existed without a Form, because a Form doth distinguish a being from all others, and giveth it unity : Now, when the *Chaos* existed, there

was :

was no other being, and it was rude and without form. To this, I Answer, Although there was no other being, yet this did not hinder, but that the *Chaos* had its numerical and positive unity, existence, determination, goodness, truth, &c. all which Accidents could not be without a Form. 'Tis said, that the *Chaos* had no form, that is, not its *forma ultima*, for which it was intended, notwithstanding it had its *Forma prima*. It remaineth then, that the *materia prima* is neither an objective being, nor much less a real being: It is no Objective being, because we cannot frame an object of it, or like to it. For what can we think of it; it is confessed it hath neither Essence, or Quantity, &c. The greatest Absurdity is, that they give it no limitation, and consequently must affirm it to be infinite, which of all absurdities is the most absurd: for nothing is infinite, but God alone. Then again, to maintain that it is ingenerable and incorruptible, is impious: for God only is ingenerable, and incorruptible.

VI. There is a first matter, which was produced at first, and out of which all second matters were and are generated. This first matter had also a first Form comproduced with it.

A Second matter is, which is produced out of the first.

The first matter is the matter of the Elements, which are four in number.

You are to note here, that by the first matter is not meant a matter formally different from the second matter, but accidentally only in respect of time: It is called first, because it was first produced.

VII. It doth not (as I hinted before) appertain to *Physicks* to explain abstractly what the first matter is, that being proper to *Metaphysics*: Wherefore *Arist.* 8 Books of *Phys. Auscult.* deserve rather the name of *Metaphysics*. That, which is requisite in this place, is to unfold the nature of the first matter, as it is a Concrete to natural Substances, & contracted to Inferiours. In *Metaphysics* it is treated of as a more universal, here as a less: for Matter and Form constitute the Elements, as more Universals constitute the lesser. Again, Matter and Form derive their Essence from the Elements; for these being abolished, they perish likewise with them. So that without or beyond the Elements there is neither Matter, or Material Form.

VIII. The first Form of a natural being is the form of the Elements; how they further constitute the matter and form of every body, shall be demonstrated as we go on.

The

The Elements being produced all at once, and at the same time, it followeth, that there never was any *Peripatetick* first matter existent without a Form; for their form and matter were both created together: but the alledging some Principles of the *Mosaick* Philosophy, will soon make this case plain.

I. God created Heaven and Earth. But how? not separately or distinctly, at several times, but united into one, and confused, at once, by one act of his Almighty Power. *Moses* sets down Heaven and Earth disjunctly, not because they were constituted as distinct bodies, but because Heaven and Earth were next formed out of that confused matter, as the Text doth afterwards clearly explain.

We call one part of that body, which ascended, that is, expanded or moved from the Center to the Circumference, heaven, because it was heaved up from the other remaining part, which was named Earth, or as it were *Tearth*, from *Terre* in French, which again is derived from *Terra*, a *Terendo*, quia *Partes suo pondere sese invicem terant*. So *Cælum* a *cernendo quod homines intuitu cælum, versus cernant*. This rude Substance was hit upon, doubtless by guess, by the ancient Poets, calling it *Chaos*, which although rude in regard to the more express Form, which it was to receive afterwards, yet it was a perfect being consisting of Matter and Form, through which it had a positive Unity, whereby it was one in it self, and distinct from nothing. It was a true being, in that it was conformable to the Divine Idea. It was no less perfect, because God created it. It was good, for it was convenient and apt to have other beings produced out of it: So that having all the Attributes of a being, it must necessarily be a perfect being, consisting of matter and form: if then the first created being, out of which all other being were afterwards created, was a perfect being, where was then the *materia prima* of *Aristotle*? which is said to be without any Form, and nothing but a *pura potentia*. You cannot reply, that the *Chaos* was produced out of a *Materia prima*; for if I grant that, then *materia prima* is a (*non ens*) nothing, because the Text mentions, that God created Heaven and Earth out of nothing.

The Objection, which may be offered against us from *Gen. 2. And the Earth was without form*, is not material: for by form here is meant an *alterior forma*, and not a *Prima Forma*.

IX. The *Form*, which did informate the *Chaos*, was that, whereby it was that, which it was, namely, a Confusion of the Elements;

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This confused form, or *forma confusiois* being expelled, there immediately succeeded a less confused, or more distinct form, arising from a purer solution and separation of the Elements: I term it *distinct*, because it was distinct from that first confusion; and *a more distinct form*, because the Elements were yet more separated, untied, loosened, and distinct. But as for a most distinct form, whereby every Element should exist separately one from the other, and every Element have a form of it self, whereby it is, that which now it is, namely, Earth, a weighty, dense, and massie substance: Fire, a penetrable, rare, and diffusive essence, &c. Before I found into the depth of this Mystery, give me leave to expose to your view the admirable manner of this divine Artifice. First, God created a *Chaos*, or a confused mixture of the Elements, in like manner to a Potter, who, having several sorts of Earth, mixes them all together into one exact mixture, afterwards he again diducts or draweth its parts from one another, and each part again after that he draweth more and more from one another, until at last it acquires that form, which he doth ultimately intend in it. So that the more he draweth it asunder, the more compleat form it receives through each several and further Diduction: So God draweth the *Chaos* more and more asunder, and every drawing, diduction, expansion, or opening, giveth it another and a perfecter form. After the same manner is the production of the *Fœtus* in the Mothers Womb perfected: where there is first a *Chaos* or exact Confusion of Genitures, then again its parts are more and more diducted, which finisheth it with a perfect Form. I shall therefore delineate each part of the Creation accomplished by Gods several and distinct (as to us) diduction, which was performed by Gods Command upon an obediential Subject, of *Let there be*. The effect resulting through vertue of this Command, was immediately answered by, *And it was so*: The Perfection and excellency of it by, *And God saw that it was good*.

There are two forms observable in the Elements: one absolute, which is, whence the particular force, power, and vertue of each Element derives. This is essential to every Element. There is also a respective form, which doth naturally derive from the first, and is, whereby every Element doth essentially encline to the other for its Existence and Conservation; for without each other their absolute form could not subsist; which flowes from their truth and goodness. Neither did they ever exist singly, but were at the same time created

created together. These two forms are really and essentially one : but modally distinct from each other. What Finiteness, Unity, Durability, or Place are the Elements capable of single ? The earth through its Gravity would be incited to an infinite motion, so would also fire, and consequently neither could possess any place, or be of any duration : but the Earth and Water being occurred by Fire and Air, their Gravities are ballanced by the Lightness of these latter : and so become withal to be terminated, and to be placed; but of this elsewhere.

CHAP. IV.

Of the Nature and Essence of the Elements.

1. *The nearest Definition of a Natural being.*
2. *The Definition of an Element. That all Physical Definitions ought to be sensible. The proof of the Existence of the Elements, and of their Number.*
3. *An Exposition of the Definition of an Element. Its Etymology and Homonymy.*
4. *What Distinction the Author makes between Principle, Cause, and Element.*
5. *What a Natural Cause is. That the Elements are no single real beings. That they are created of separately and singly Ratione only.*
6. *That there are but three Natural Causes. Their Necessity proved in Particular.*

I Have hitherto given you the remote Definition of a natural being, and now I state one somewhat nearer to our Senses, and such as is through it self perceptible by sense.

A *Natural being* is an Essence constituted out and through the Elements : or thus, A natural being is that, which is constituted out and by natural Causes : but none are natural causes, but Elements only; wherefore the former Definition being the nearer, and proved by the latter somewhat more remote ;

We shall rather commend it, as being perceptible by sense ; for

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none

none can deny, but that the Elements are the sole natural causes : Show me by any of your senses what natural being there existeth in the world, but what is Elementary. Possibly this Definition may displease you, as being different from *Aristotle's*. Let me tell you, that most part of the *Peripatetick* Definitions in *Physicks* are too remote from our senses, which causeth a difficulty of apprehending them, and proves a doubtful way for to lead us into Error.

II. An *Element* is an internal natural Cause out and through which a natural being is essentially constituted. In *Metaph.* we have defined a natural being to be internally consistent of *Matter* and *Form*, which are also called *Natural Causes in general*, but *remotely*: because we cannot apprehend *Matter* and *Form*, unless by a nearer thing representing both to our senses; as, through the Elements we know what *Matter* and *Form* is: were it not that our sight perswaded us, that a being was produced out of the Elements, we should be ignorant what *Matter* were; and so the like of the *Form*. Here you may take notice of the difference between a *Metaphysical* Definition, and a *Physical* one; the latter being immediately perceptible through our Senses, and abstracted from sensibles, the former being proper to reason and the mind, which doth mediately abstract its notions from these, according to that Trite Saying: *Nihil est in intellectu, quin prius fuerit in sensibus*. the understanding knoweth nothing but what it hath first perceived by the senses. Now I will make clear to you, that all natural beings do (*proxime*) immediately owe their essence to the four Elements. Herbs spring forth, out, or from the Earth; but not, where there is no Water: for there it proves sandy or barren, unfit to protrude any vegetable.

2. Although earth is sufficiently moistened by attenuated water, yet unless the Sun can or doth through its Beams cast a fire to it, or by the same fire raise and excite that fire, which is latent in the earth, it remaineth nevertheless barren. Lastly, Air is comprehended by water attenuated, that is, Water and Air mixt together in such a proportion, that the tenuity of the air may render the water attenuated and fluid, that so it may be apt to penetrate through the depth of the Mixture; for otherwise water of it self is of that thicknes, that it exceeds Ice or Chrystal. Now this Air inflated, or Water attenuated doth open and expand the density of the earth, makes way for the fire to enter, and at last retaines the whole mixture in a coherence and compactness. Of this more hereafter.

Again,

Again, A body consists of the same Principles or Elements into which it is dissolveable; but all natural bodies are dissolveable into the first Elements: therefore all bodies consist of the said first Elements. I shall only instance in some few examples for proof of the *Minor*. Milk in its dissolution is changed into Curds, which through their weight go down to the bot. com. & are analagous to earth. 2. Into Butter, which containeth in it incrassated ayr and fire, for it is also inflammable, a sign of fire. Lastly, Into Whey, which is responding to attenuated water. The like is observable in Blood, dividing it self into Melancholy, expressing earth in its weight, colour, and Substance; for drying it, it becomes perfect Sand: into Choler, agreeing with fire in its motive and alterative qualities: into pure blood, through its gluing quality or lentor, not unlike to incrassated ayr: Lastly, into Plegm or Phlegme, resembling water. Doth not the ordinary division of mans body in spirits (*impetum facientes*) humors and solid parts, demonstrate its composition or constitution out of the Elements? For the Spirits are nothing else but fire and ayr, Humors contain most water, and the solid parts most earth. The Spagyrick Art proves the same by distillation, through which water, Spirits and Oyl (the two latter being made up most of Fire and Ayr) are separated from the *Caput mortuum*, *Sal fixum*, or earth and Subsidiaries. 'Tis true *Sal*, *Sulphur* and *Mercurius* are different Names, but *re ipsa* are the Elements: What is *Sal* but Earth? *Sulphur* but fire and ayr? *Mercurius* but water? Hereby I have not only proved the existence of elements, but also their Number. *nominatim aq; in specie.*

III. Give me leave to expound the Definition in the first place *quantum ad nomen.*

In the word Element is considerable its Etymology, from *εἰσὶν* *vel εἰσεύω, capio: quod elementa in sese omnia capiunt mixta.*

Its name is likewise homonymous, in a large sense promiscuously (*converibilibiter*) denoting a Principle, or Cause. In a strict sense, it is differing from both. *Endemus*, *Alexander*, and *Thomas* *Aq.* opiniare, that through Principle (*Principium*) is only meant an agent cause: through Cause, a formal, and final Cause: through elements, Matter. *Averrhoes* and *Albert.* by Principles intend an efficient cause: through Causes, final Causes: by elements *Matter*, and *Form*. Generally Principles are understood to be of a larger extent then Causes, and Causes then elements. So that *Aristotle B. 5.*

Arist. Met.
b. 6. c. 1.
Text. 1.

of *Metaph. Ch. 1.* describes a Principle to be that, from whence a thing is, is made, or is known: by this you see, that a principle is of a more large signification then either of the others: but a cause is, which contriouteth to the being of a thing, either by substituting it self for a Subject, as the *Matter*: or through actuating and giving it an essence, and its consequence, as the *Form*: or by determining it to an end, as the final cause.

IV. The distinction, which I have made between them, is, that *cause* is of a larger extent, then *Principles* are taken in *Physicks* (but in *Theology* a Principle is larger then it) these denoting the internal causes of a natural being, as matter and form, but remotely, as I have already hinted: *Elements* point out to sensible and immediate internal causes of a natural being.

V. A natural cause is, which hath a vertue of acting naturally, or which acteth according to that power which God hath conferred upon it at its first Creation: So that *Van Helmont* saith well in his *Physic. Arist. Dist. 3. Ego vero credo, naturam jussu Dei, quo res est id quod est, & agit quod agere jussa est.* But I believe, that Nature is Gods Command, through which a thing is that, which it is, and acteth that which it is commanded to act. They are Causes, to wit, internal causes or principles of a being, because they contribute themselves to the constitution of that being. I said *out of which*, because they are the matter of all natural beings: and through which, because they are also the Form of all the said beings. How they are or become so, you may expect to read below. The elements are described and taken singly or separately, *ratione* only, or *ex supposito*, and not *realiter*: for they never did exist singly (neither could they exist so, supposing they were created in that nature, in which they were, because of their relative forms) but confusedly in the *Chaos*. *Aristotle* nameth the bodies constituted by those mixt bodies, as if they were different from naturals: but that was only to make good the first part of his *Metaphysical Physicks*, and thereby to distinguish them from the others, namely his proper and elementary *Physicks*.

VI. Three causes do concur to the production of a natural being, whereof two are internal, to wit, *natural matter* and *form*; the other is external, namely, the Efficient. I prove the necessity of these three: first there must be a Subject or Matter, out of which a being is produced: for (*ex nihilo nihil fit*) out of nothing nothing can be produced.

produced. But I instance in some particulars; the good wives know, that for to make a Pudding, they need Matter (namely Flower, Eggs, &c.) to make it out of; or to build a House, a Mason will require Stones for his Matter, &c. Now when they have these materials, they endeavour to make something of them, that is, to introduce a new thing, shape or face into it, or educe a new thing out of it (which locution is more proper then the former, it being the efficient doth *ex intrinseco quasi formam educere*) and what is that but the *Form*? And lastly, Experience tells us, that (*quod nihil fit a seipso*) nothing is produced from it self, but from another, which is the *Efficient*: as in the building of a house, you may have stones and Morter for your matter, yet unless a Mason (who is the *Efficient*) place them together, and introduce or rather educe the form of a House, the matter will abide matter.

CHAP. V.

Of New Philosophy, and the Authours of it.

1. *Helmontius his Arrogance and Vainglory. How, and wherein he rejects the Peripatetick Philosophy. His own Principles.*
2. *The Life and Death of the said Helmontius.*
2. *A Confutation of all his Physical Principles in particular.*
4. *Some few Arguments against Rerè des Cartes his Principles in general.*

I Thought fit to make a stop in my Discourse, and before I proceed any further, to propose the Opinions of others concerning the first Principles, Elements, and Constitution of natural Bodies. *Baptista van Helmont* impropriating the knowledge of true Philosophy and Physick to himself alone, calls *Hippocrates, Galen, Aristotle*, and all other wise men Fooles, and terms their Dictates figments; but withal propounds new foundations of Philosophy and Physick, threatening a great danger to those, who did obstinately adhere to their Tenents, and promising an infinite treasure to such, as should receive his. Wherefore I shall first contractly relate his

his Philosophick Principles; then examine them. *Fol. 33. of his Ort. Med. Diff. 3.* He reproves the heathens for falsely teaching the Number of Elements to be four: as also for asserting three Principles, to wit, Matter, Form and Privation. All things (saith he) are idle, empty, and dead, and therefore stand only in need of a vital and seminal Principle, which besides life, have also an order in them. He denieth the four Genders of Causes, the first matter, the causality of a form, receiving it for an effect alone. Further he states only two causes, namely *Matter*, and her *internal Agent, Efficient*, or *Archeus*. In the same place he terms *Matter* a co-agent, not a subject, which, he saith, was improperly attributed to her by Philosophers. And in *Diff. 21.* he denieth the congress of the four Elements, yea not of two of them, to concur to the constitution of mixt bodies. His two Causes or Principles, he calls bodies in one place, in another (as you may read below) he detracts it from the latter. The first of the said Principles is called *ex quo*, out of which, the latter, *per quod*, through which. *Diff. 23.* he concludes water to be a beginning out of which (*initium ex quo*) and the Ferment to be the seminal beginning through which, that is, *Disposing*, whence the *Semen* (Seed) is immediately produced in the matter, which it having acquired, becometh through it life, or the *media materia* (the middle matter) of that being, extending to the period of the thing it self, or to the last matter. *Diff. 24.* The Ferment is a created formal being, which is neither a Substance or Accident: but neither, in the manner of light, fire, magal, forms, &c. created from the beginning of the world, in the places of their Monarchy, for to prepare and excite the *semina* (seeds) and to precede them. I consider the *ferments* to be truly and actually existing, and to be individually distinguished through *Species* (kinds.) Wherefore the ferments are Gifts and Roots established from the Lord the Creator to all ages, being sufficient and durable through their continual propagation, that they might raise and make seeds proper to themselves out of the water, to wit, wherein he gave the earth a virtue of germinating, he gave it as many ferments, as there are expectations of fruits, Wherefore the ferments produce their own seeds, and not others. That is, each according to its Nature and Properties: as the Poet saith; *For nature is underneath the earth. Neither doth all ground bring forth all things.* For in all places there is a certain order placed from God, a certain manner and unchangeable root of producing some determinate

determinate effects, or fruits, not only of Vegetables, but also of Minerals and Insects. For the bottomes of the earth, and its Properties differ, and that for some cause, which is connatural and co-eval to that earth. This I do attribute namely to the *formal ferment*, that is created therein. Whence consequently several fruits bud forth, and break out of themselves in several places: whose seeds we see being carried over to other places, come forth more weakly, like to an undercast child. That which I have said concerning the ferment cast into the earth, the same you shall also find in the Ayr and the Water. The difference, which there is between the ferment and efficient, is, that the former is the remote Principle of Generation, and produceth the latter, which is the *semen*, which is the immediate active Principle of a thing. Here you have a *Synopsis* of his Philosophy, which in the progress throughout his Book, he repeats *ad nauseam usq.*

II. When I first took a view of the Title of his Volume, which was, *The Rise of Medicine*, that is, *The unheard of Beginnings of Physick. A new Progress of Medicine to a long Life for the revenge of Diseases*, by the Author *John Baptista van Helmont*, Governour in *Merode, Royenlorch, Oorschot, Pellines, &c.* He might be Governour of himself in those places, but not of, &c. I wonder what those places signified, since the people of *Brussel* admired upon what his Heir liveth. This old man in his life-time was strangely melancholy, and by Fits transported into Phanatick Extasies; questionless had he been of a Religious House, he would much have added by help of these Raptures, to the incredible Bulk of the *Golden Legends*; but his *Demon* turned them to Physick: He had a great Design in Christening his Son, *Mercurius*, to have made another *Trismegistus* of him: and not unlikely; for wherever he is, he is all-knowing. I was much abused by the Title of his Tract, hoping to have found a new found *Archologia*; and lighting upon ignorance of Terms, abuse of words, but a most exact Orthography, limiting almost every second word with a Comma, or a stop, as being measured by his astmatick breathing. The Fame, which he deserved from his Countrey-folkes, was equal to a famous Mountebank: The Church-yard was the surer Register of his Patients: His Arrogance and Boastings were Symptomes of his depravate conceptions: His Cruelty fell at last upon his own bowels, through which he lost his Life for the neglect of very ordinary means. This is the account I

had

had at *Brussels* of his Life and Transactions, which I thought was not unworthy of my insertion in this place, thereby to disadvice some from a rash belief to his vain words, that so they might avoid the same Dangers and Cruelties upon their own and other mens Lives.

III. But in reference to his Dictates: He rejects the number of four Elements, without proposing any Argument for Confutation. He denieth the existence of a first matter, also without giving proof for the contrary. Both which we have already demonstrated. The form is an effect (saith he) and not a cause: this argueth his misapprehension of a cause and effect: for most Authors agree, that a cause (in a large sense) is, whatever produceth an effect; now the form produceth an effect, in giving a specification to the whole. It seems he intends nothing for a cause, unless it be really distinct from its effect (which in a strict and proper sense may be allowed) but if granted, nevertheless he is in an Error, for asserting *Matter* and the *Archeus* to be causes; neither of which are really distinct from the being constituted by them. Further, it is no reason, that, because the form is an effect, therefore it can be no cause; for all beings in respect to their own production are effects, and yet are causes of the constitution of others. All things (saith he) are idle, empty and dead, without a vital principle: Judge his absurdity: What are all idle, empty and dead things without a life, but a *materia prima Aristotelica*? For he himself affirms, that there are but two principles, Matter and a vital Principle: yea those very words *idle, empty and dead*, square with these of *Arist.* *Materia prima est nec quid, nec quale, nec quantum.* He allots only two causes, *Matter*, and her internal efficient to the generation of a being. First, as I have proved, it is impossible for this internal efficient to be reduced in *actum*, unless an extrinick efficient, be it the Sun, or some other particular efficient, excite it by contributing some of its own virtue to it. Secondly, Would not all Philosophers deride him for saying an *intrinick efficient*? since that all have consented to term an efficient extrinick, in contradistinction to intrinick or internal, which is ever a part of the being constituted by it, whereas an efficient is named extrinick, because it doth not constitute a part of that being, to whose production it was concurring. Thirdly, Wherein is his *Archeus* or internal efficient different from a form, which he doth so much detest? Is not this *Archeus* an effect also of its preceding cause?

cause? Doth he not affirm, that this internal efficient giveth life to its matter, and what is a form, but which giveth life or a being, distinction, and specification to its matter?

Here again he saith, that *Matter* is a *Co-agent*, and before he stated, that the was idle and dead, certainly idle and dead things do not use to act, or to be agents, or co-agents. That matter is not a subject he asserts, and before and afterwards he granted, that she contained the *Archeus*; What is a subject, but that which doth contain a thing? Here again he addes a Note of distinction to his *Archeus*, which is to be *per quod*, and is not this also an inseparable Attribute of a Form?

Dist. 23. Here again he delivers a new Philosophy, in stating *water* to be the sole material Principle (although below he adjoynes earth to it) the *ferment* to be the remote efficient, and the *semen* to be the immediate efficient: so then, now there are three Principles, yea four; *Water*, *Earth*, and a *double Archeus*; whereas before there were but two. Besides here he vaunts out with a three-fold matter, a *materia prima*, which is a co-agent with the *fermentum*, or first *Archeus*, a *materia media*, a subject of the *semen*, or second *Archeus*, and a *materia ultima*, quickned through life it self. So now he is got beyond the number of the *Peripateticks*; three distinct matters, and three internal efficient, make up just six Principles. Surely the old man was climed up into one of his Raptures. Well let us go on in making disquisition upon the 24.th *Dist.* The *Ferment* is a created formal being: Just now there were no forms, and now the *ferment* or the *prime Archeus* is metamorphosed into a form: Where was his Memory? It is not a Substance or Accident (saith he) but neither, in the manner of Light, Fire, &c. How? neither a Substance or Accident, neither Spirit or Body: neither *quid*, *quale*, or *quantum*: Ergo it is nothing, but a *merum signum*. If it be in the manner of light, or fire, it is in the manner of a quality, or substance. Now I think, I may let him run on in telling out his Tale.

IV. *Cartesius*, a great Proficient in the *Mathematicks*, laboured much to reduce all Philosophical conclusions to demonstrations, depending from certain *Hypotheses*; but wherein they excelled the ordinary, or *Peripatetick* ones, either in truth, certainty, or evidence, I have hitherto not yet learned. If they may be comprehended within the limits of Demonstrations, they must be a *posteriori*, conclu-

ding only the *ēts* of things, or their effects by improper and affined Causes: so that the causes remaining still under a cloud, we cannot be satisfied in any such Science. 'Tis true; did those fore-mentioned suppositions appear to us as *Phænomena* (appearances) like unto others in *Astronomy*, there might thence some ground be afforded, but they being *mera figmenta* and *entia rationis*, must necessarily prove very sandy for to build real truths thereon. Neither do his suppositions cohere in all places, he admitting many *supposita non supponenda*, yea *contradicentia*, to their number.

Besides to frame, think, or imagine, that God (like unto a Porter, turning his Wheel round with a staffe, and grinding the Clay thereon into many pieces, figures and whirls) should grind the *materia prima* into several pieces, whirls, figures and shaps, is no small absurdity, especially when Scripture doth so positively teach us the contrary. Would a mans mind be carried forth to such *Chimera's*, surer and evident Principles might be proposed by the means of Numbers. But tell me what satisfaction can any one expect, from such Conclusions, as long as their Premises are not granted, but thought figments and falsities? For it is not the effects we enquire into, but into their real and adequate causes. Doth he make any thing more plain, or doth he thereby escape all falsities? Certainly no; for many of those Assertions that are thence deduced, do manifestly partake of falsities and Errors; as,

1. That the nature of a body doth not consist in weight, hardness, colour, or the like, but alone in extension.
2. He speaks a word or two only of rarefaction and condensation, and so away: I conceive the rest did surpass his Mathematical demonstrations.
3. That a corporeal substance, when it is distinguished from its quantity, is confusedly conceived, as if it were incorporeal.
4. He disproves a *vacuum* by an *idem per idem*, thus; there is no *vacuum*, because the extension of all bodies is equal to their internal and external places. The question is the same still; viz. Whether all external places are filled up with extensions of internal places of bodies?
5. He denies real Atomes.
6. That motion taken properly, is only to be referred to the contiguous bodies of that, which is moved; neither is it to be referred, but to those contiguous bodies, which seem to lie still. A fundamental error.
7. That

7. That matter is infinite, or divisible into infinite parts.
8. That the world is of an indefinite quantity.
9. That the second matter of Heaven and Earth is one and the same.
10. That all matter is really single, and obtaineth its diversity of Forms from local motion.
11. That in one body innumerable motions are possible.
12. That the Moon and the other Planets borrow their Light from the Sun.
13. That the Earth is in nothing different from a Planet, and consequently that the other Planets are inhabitable.
14. That the Moon is illuminated by the Earth.
15. He assumes most of the erroneous Opinions of *Copernicus*.
16. That all the parts of the earth are light.
17. That Water is convertible into Ayr. Neither are his Definitions (if he hath set down any) of the Elements, as of Fire, Ayr, Water, or Earth, plainer then *Aristotle* hath explained them: His Demonstrations are altogether remote from sense: Besides the confusedness of his method. In fine, I cannot imagine what practick use may be made of them. As for these Particulars which I have here cited against him, I shal prove their falsities in the progress of my following Discourse.

CHAP. VI.

Of the Material Principle of Natural Beings.

1. *The Causes of the Elements.*
2. *That the Elements are really compounded natural beings.*
3. *That Matter and Quantity are really identified.*
4. *What Quantity is. What its Ratio formalis is.*
5. *That in rebus quantis there is a maximum and a minimum Definitum.*
6. *Experimental Instances proving that there are actual Minima's, and that all natural beings do consist out of them.*
7. *The pursuit of the preceding Instances inferring a Continuum to be constituted out of actual Indivisibles. Some Geometrical Objections Answered.*

Somewhat hath been heretofore stated, touching the matter and form of Natural bodies, which being remote, we must descend lower, and adde a few notes respecting the matter and form of the Elements. Wherefore remember;

I. That the elements are natural beings, and therefore consist of natural matter and form, and are constituted from an Efficient.

II. The Elements arising from the conjunction of matter and form, are not to be counted single bodies in that respect, nor in any other, but as much compounded, as any other body derived from them: that is in this Phrase: *Elementa sunt majora composita, ac cetera ab ipsis orta entia, quanquam hæc illis censenda sunt magis composita*: So that it was an error in *Aristotle* to define an element by a single body, or being. They could not be thought to be single in any other respect, but in their real separate existences; but such they never had any*, their relative form contradicting it.

*That is, intirely separated existences.

III. It is a property in matter to be an internal cause, which through its quantity is capable of receiving a form: So the elements were affected with a quantity, through which they received their forms. I do here strive as much as may be, to reserve that old custom of termes and phrases in *Physicks*, which *Aristotle* hath assigned to us;

us; but again reflecting upon the abuse and impropriety of them, I am compelled to call to mind a Rule of my *Metaphysics*; to wit, that the essence of all things are but modes united: and for that reason, counting quantity a mode, I cannot make any thing else of matter, but a mode, (I mean matter in a concrete sense) for what is matter really, but quantity it self, they differing only *ratione*? and how that? Thus; Quantity is only notional, or a term affixed by the understanding to a *res quanta*, for to explain that a thing is made out of it; and yet that whereout the thing is made is quantity still. So form is nothing else but a notion, whereby we express the activity and quality of a thing, and beyond that activity and quality it is nothing: Wherefore observe, Quantity and Quality being the two essential, principal, and eminent modes of a natural being, and fit terms and notions, they are usually treated of distinctly in this part of Philos. under the name of matter and form. Now do not take either of them separately for a Substance, unless they be both joyned together. You may also remember, that Quantity is the only Accident allowed to matter by the *Peripateticks*, but this quantity not being possible to exist through it self, others did confer a *forma quantitativa* upon matter: for a *forma* they imagined it needed, because through it quantity was distinguished from nothing; now that which makes a distinction is the form only. Besides, what is quantity without form? Even nothing, because without a form it is not that which it is, as further appears by the definition of a form. Since then we have proved, that matter is primarily nothing else but quantity, we shall easily make it appear, that it cannot exist without the other modes, as place, duration, &c.

IV. Quantity is a mode of a being, through which it is extended, that is, through which it hath one part existing beyond the other: or thus, Quantity is the Mole, Magnitude, or Dimension of a being. That which doth immediately follow this magnitude, is the extension of parts, and that which doth follow this extension, is internal and external place, and habit, &c. I say, these affections follow one another, not really, for they are existent all at once; but intentionally only, because the one doth represent it self to the understanding before the other. Now, when the dispute is about the *Ratio formalis* of quantity, whether it be divisibility, mensurability, mole, magnitude, extension of parts, &c. it is to be understood, which of them doth primarily represent it self to the mind, not
which

which of them is *re prius*; for they are really co-existent, and identified. In Answer to the Question thus stated, I hold, that the *extension of one part beyond the other*, or its repletion and possession of place, is the *potissima ratio quantitatis*. That which we do first conceive through the perception of a *res quanta*, is, its repletion of place, or extension of one part beyond the other: for at the first sight of a body, we judge it to be a body, because it appears to us to have one part extended beyond the other, or to possess a place; this is presently after confirmed to us, because it seems to be a bulk, mole, magnitude, or to be divisible, and by that we conclude, it is no Spirit, or nothing, and (as I said before) because it doth replenish that place, and is commensurated by it. As for extension of parts one beyond the other, it is the same with the repletion of an internal place: which that it hath, we come to know through its repletion of an external place. Take quantity *concretè* for a *res quanta*, or *res extensa sive locata, mensurata, divisibilis*; it matters not which, as long as we agree in *re*, although differing in *nomine*.

V. In Quantity or rather *rebus quantis*, or in *materialibus*, there is a *minimum definitum*, and a *maximum definitum*. Wherefore all beings must be one of those, or interjacent between them: for that, which is less then *minimum*, is nothing; that which is more then *maximum* is *infinite*; neither of which is natural. Fire, we see, if it be less, then it can abide in its least quantity, it goeth out, and becomes nothing. So whatever is less then a Sand of earth, or the least drop of water is nothing of the said *Species*. That which is *actu* greater then the world, is infinite; neither is there any thing bigger (*quantitate materiali*) then it; ergo there is a *maximum*. Further, were there not a *minimum*, or a *maximum*, there must be an *infinite actu* granted, which the finiteness of all things in the world perswades us to deny. All grant quantity to have a *terminus a quo* and *ad quem*; and what can these *termini* be else, but a *minimo ad maximum*? If otherwise a thing be supposed *ultra minimum* and *maximum*, it is *ultra terminum*, and *indeterminatum*, or *infinite*. All quantitative beings are dissolveable into their *minimum quod non*, as we may observe in distillations, where water is dissolved into its least vaporous drops, beyond which it vanisheth; and in sublimations, where the subtillest and finest points of earth are carried up to the *capitellum* in the least parts, that nature can undergo. Fire ascending Pyramidally, first disperfeth it self into its least points, after which,

which, into nothing. The Ayr is divided into its least parts, as it is seated within the Pores of bodies. All these Instances imply parts divided into *minima actualia, realia & physica*: so that they are not *minima potentialia*, or *Negationes*, as *Peripateticks* and *Nominalists* do obstinately obtrude.

That is, beyond its points it is nothing.

VI. Well then, let us pursue these Instances: Water being dispersed into its least parts in the head of a Limbeck, they come to unite again into one body; which is a manifest Argument, that a *continuum* is composed out of indivisibles alone (for *minima's* are indivisibles, otherwise they could not be *minima*) in this following manner. When the whole head of a Still, or only part of it, is so thick and close beset with vaporous points, that they come to touch one another, then they do unite into a *continuum*, and make up a body of water. The same is observed in subliming earth into its indivisible points, which sticking to the *Capitellum* of the *sublimatory*, do no sooner return into a Clot of earth, then these sands come to touch one another. Is not a Line also made through union of points in the same manner? as appears in this Example, take a round Ball and cast it upon a plane, it first toucheth the Plane upon a point, and bending further to the plain, it makes another point close to the first, and so on many more; all which together, describe a Line upon the said plane. Numbers are notional Characters of real beings, but they do likewise contain a *minimum*, to wit, *one*; ergo also those real beings whereunto they are applied. Is not time composed out of instants united, and motion out of (*ex impetibus*) spurts joyned to one another? That there are instants and spurts, the Operations of Angels do confirm to us. Divide a Line into two parts by another Line, the divided Line is divided in its least part; where again the divided particles joyned to the dividing Line is also in their least points, or indivisibles, which three points must necessarily make up a *continuum*: the reason is this, because that, which through its being taken away, doth take away the continuity, must also constitute that same continuity by its re-addition. Lastly, Grind any matter upon a *Porphir* into an *Aleol*, which if you grind longer, you shall sooner grind it into clods and bigger pieces then lesser; the reason is, because nature is irritated by the violence and heat of grinding, to call the Ayr to its Assistance, which gluethe its body again together. I could adde many other Experiments confirming the same; but to avoid prolixity, I shall omit their Inference.

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We may then without danger of any further cavil, state, that Indivisibles are actually contained in their whole, since the whole is both constituted out of them, and dissolved into them at its dissolution.

2. That there is a *minimum* and *maximum* in all natural bodies, whether animated or inanimated. I cannot but strange at the stupidity of Authors, who object certain Propositions of *Euclid* against this kind of Doctrine, as,

1. That of 1 *El.* 1 *Prop.* Where he teacheth, that upon every right line given there may be an equilateral Triangle described: Whence they infer, that all lines are divisible into equal parts; if so, then it contradicts the aforesaid Positions: For (say they) suppose a line consisted of three points, it could not be divided but in unequal points, or parts: it cannot be divided into a point and an half, because a point according to this Definition is indivisible.

2. *Euclid* demonstrates in the 6 *B.* p. 10. that a line, be it never so little, is divisible in as many parts of the same proportion, as the greatest line may be. Now then supposing a line consisting of three points, and another consisting of ten, or more, the former line is divisible into three parts only, the other in many more.

Granting the truth of these Propositions, it concludes nothing against us; for these prove against the composition of a Mathematical line out of Mathematical points, which we all know to be infinite, and in a *continuum* drowning each other, they cannot make up its length; but these are only notional, and therefore we may not thence deduct any certain Rule applicable to the *natura rerum*: for if we should, why might we not likewise infer thence, that the world being a *continuum*, consists of infinite parts, and that its duration is eternal, because that being a *continuum*, must in the same manner consist of infinite parts: or thus, we might infer, that the numbers framed by man being infinite, all things, upon and for which they were imposed, are also infinite: but this doth not hold in *naturalibus*, although in *conceptibus*. It is certain, that man can & doth conceit millions of Notions, especially in the *Mathematicks*, which never have been, or shall be (to wit, in that same manner) in nature. Our case at present is concerning Physical points, such as have a determinate Longitude, Latitude, and Profundity, but the least. The forementioned Propositions are related to

Continuities,

Continuities, as they contain indivisibilities *potentia*; but these are contained *actu* in theirs. The points, which we treat of have a Magnitude and Mole, which although *minima*, yet apposed one to the other, constitute *majora*, and being augmented to the greatest number, produce a *maximum*. They remain divisible *Mathematicè*, but *naturaliter* indivisible. Here may be objected, if these *minima* are *quantia*, they are also divisible. I Answer, That they are divisible *quoad nos*, but indivisible *quoad naturam*: or as I said before, they are divisible *Mathematicè*, not *naturaliter*. We conceive them to be divisible, because they appear mensurable although with the least measure, they are mensurable because they are located, they are located because they have Magnitude.

CHAP. VII.

Of the Natural Matter and Form of the Elements.

1. *That the Elements are constituted out of minima's. That they were at first created a maximum divisible into minima's.*
2. *That, supposing there were a materia prima Aristotelica, yet it is absurd to assert her to have a Potentia Essentialis, or Appetitus Formæ.*
3. *That the Natural Form is not educed e Potentia materiæ.*
4. *That the Actus of Local Motion is the Form of the Elements.*
5. *The manner of knowing the first constitution of the Elements. That there was a Chaos.*
6. *That there was conferred a distinct form upon every Element. Whether a Form is a Substance. 'Tis proved that it is not.*

I. **A**ND now give me leave to apply what hath been stated in the preceding Chapter to the Elements, which as they are constituted out of Indivisibles, Points, or *minima's*, so they are dissolveable into the said Indivisibles. At their first Creation they were each created a *Maximum*. Their matter is nothing else but their concrete quantity, mole, or magnitude. Neither are we to

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imagine,

imagine, that God did create all the *minima's* of the world, before he united them to one Mass, but created the whole Mass at once, divisible into indivisibilities, that so they being divided into indivisibilities might become a fit matter for mixture; and therein he imposed an order and law upon the Elements of generation and dissolution: and without this Law, what Order is there imaginable?

II. Supposing these points coagmented into one Mass, were created before the advent of a form (which is impossible *secundum quid*) and being without any determination, figure, motion, or any thing, that descends from a form, it would be nothing differing from *Aristoteles materia prima*: Now then I demand what *Potentia essentialis*, or *Appetitus forma* could there be rationally conceived to inhere in her? Certainly no *essential* one, but *obediential*; neither an Appetite to a form, for she being blind, how could she perceive a form, to covet it? or being destitute of motion, how could she have an appetite? since Appetite is nothing else but a natural motion, or inclination.

III. Matter having brought quantity, place, habit, and duration along with her, let us further enquire what company the form hath attending it. A form, as we said before, is little else but a *Mode of activity and quality*: For quantity without her is nothing of her self; it is the same that doth constitute her, and addes *distinction* and *action* to her. That, which giveth *activity* and *quality* to Matter and *Quantity* is an *actus* of *Local Motion*. This *actus* of motion is not raised out of quantity or matter, for then it would remain quantity, neither is it educed out of the disposition of matter; for even so it could be nothing yet but matter disposed. Wherefore it is a strange saying to assert, that the form is educed out of the power of matter: Either this may be taken properly, and then it is equipollent, as if you said, the form is educed out of the matter, as she is potent, that is, as having a disposition or propension unto; and this is impossible: or improperly, when the power of matter is taken for a being, which as yet is not, but may be; neither can the form in this sense be educed; for she then would be educed *e nihilo*, or *e privatione*.

IV. That the *actus continuus* of local motion is the form of the Elements: I prove it. That, which is the first cause of all the effects acted by the Elements, must needs be their form: but such is the act of local motion.

motion. Wherefore, &c. I shall omit the proving of the *Minor* here in general, since I have proved it below in particular.

V. The particular production of each part of the world holds forth the manner of the production of the whole, since they are all derived from one universal efficient, *Nature Natruring*. We observe then daily: as for instance, in the production of Man, Beasts, Fowls, Minerals; that these draw their first Original from a confusion of Principles or Elements, which is an assured note, or mark, that the Elements of the universe were first cast into a confusion (*quia pars totius naturam amulat.*)

2. It is no less undoubtable, that as the activity and qualities of these fore-instanced formations were latent, and contained in their confused Elements, and gradually extracted, inacted, and exalted to their (*ἐκπύη*) perfection, through the virtue of an efficient, in like manner were the activity, and qualities, or forms of the elements latent in their *Chaos*, and afterwards gradually extracted, expanded, divided and exalted into their fulness by the same *Nature*.

3. It is hence apparent, that the Elements underwent several changes, but total, not partial ones, and therefore require a particular disquisition upon each.

VI. Let us imagine many millions upon millions of *minima* of so quantity, or matter divided into four equal parts, whereof each is set apart to be the matter and subject of every one of the four Elements. Each of these, 'tis necessary should be vivified and actuated by a distinct form, for otherwise they could not in their dissolution from the *Chaos*, prove apt substances for the constitution of distinct bodies. Or simply, a form is needful, or how, or by what power could they act? But the question will be, whether this form is not an incomplete Substance, as the *Philosopher* states. The question, me thinks, is rather, whether it is not a Bull to name a substance incomplete? For a substance is, a substance because it is compleat, and its completion or perfection gives it a *substance*: so that were a form a substance it might subsist *per se*: Besides, would it not according to *Aristotle* make an *unum per Accidens*, or could it be directly referred to a Predicament, were it united to another real substance? Neither is it sufficient to distinguish it from an Accident, because it doth constitute part of the *compositum*: for so doth every other accident or *mode*, as appears in *Metaphysicks*: Doth it not

inhere in *Subiecto per modum accidentis*, or can it exist out of it? And wherein is it then different from an Accident?

2. It is frustraneous for the form to be a substance, since that a being through its quantity only is capable of receiving quality, and activity or virtue of acting*.

* That is, an actual virtue, or continued act.

A form then is a power of acting in a substance, but not a substance; it is essential to a being, but modally only distinguished from it, not really; for an activity in a substance is nothing else, but an active substance.

The concomitants of this activity, or form are many, as alterative qualities, colour, figure, and all determination and distinction: In a word, it renders its subject *hoc aliquid*.

Although the form is not educed *e potentia materiae*, it hinders not from being educed *e potestate actuali Agentis, vel efficientis*, as Scaliger delivers.

CHAP. VIII.

Of the Absolute and Respective Form of Earth, Water, Ayr, and Fire.

1. *What Form it is the Author allots to Earth. That driness is not the first quality of earth.*
2. *The respective form of Earth.*
3. *That Coldness is not the first quality of Water. That water is not moist naturally, neither doth it moisten: What it is to moisten. Why water acuated with Spirits of Viuriol, Sulphur, or of Salt-Peter, doth moisten and abate thirst more then when it is single.*
4. *The form of water. What Gravity is, and what Levity. What Density is. The form of water proved. Why water disperseth it self into Drops. Why Sea-men cannot make Land upon the Cap-head, when they may upon the Top-Mast-head. Why the Stars do appear sooner to those in the East-Seas, then to others in the West.*
5. *That water is thick but not dense. Whence it is that water is smooth. Why Ayr makes a Bubble upon the water when it breaks forth. That the least Atome of Ayr cannot break through the water without raising*

raising a Bubble. Why the same doth not happen to Earth,

6. That Moisture is not the first quality of Air, neither doth the Air naturally moisten any body, but to the contrary dryeth it.
7. The form of Air. What Tenuity is. Why Feathers, Cobwebs, and other light Bodies do expand themselves when thrown through the Air. Why Grease, Oyl, Wax. &c. do make Splashes when poured upon the ground. Why Gunpowder, Smoak, Breathes of living creatures, Vapours, Exhalations, Dust, &c. do diffuse themselves in that manner. Whence it is that the least breath moves and shakes the Air. The relative forms of Air. Why Spirits of Wine mix easier and sooner with water, then one water with another.
8. The first quality of fire. What Rarity is. Whence it is that a Torch or Candle spreads its Beames circularly, as appears at a distance. That Fire is root: the cause of it. Fire's Relative nature. A comparing of all the first qualities of the Elements one to the other.

I. **T**HE Form lately mentioned may justly be surnamed *entelechia*, Perfection; because it confers a Perfection upon matter. But to return where I left: After sufficient evidence, that each of the Elements are actuated by a distinct form; I begin first with the Earth, whose form and first quality is weight (*pondus*) with density.

1. Because through it, it performeth all its Operations and Effects.

2. The form, or first quality of a body is unremoveable; but dense weight is unremoveable from earth; ergo it is its form, and first quality; whereas dryness, which is brought in competition with it by all Peripateticks, is removeable; for earth may be moistened with water. This is an *Herculean* Argument, if well weighed.

3. A Privation cannot be the first quality of earth, because it is accidental to it; but dryness is only a privation of moisture, and consequently accidental. I confirm the *Minor*; had there never been any moisture, who could ever have thought of dryness? Again, in the ordinary Ideom of speech, we say, such a thing is dry, because we feel no dampness in it: for first we feel, and gather it together to try whether we can feel any moisture; but perceiving no moisture, or dampness, we say it is dry: Ergo, because of the privation of moisture. Further, moisture and dryness are privative opposites, because the one being removed, the other also vanishes: For take

away

away sight, and you take away blindness ; it being improper to say a thing is blind, unless in opposition to sight. The same is applicable to dryness and moisture ; take away *moisture*, and then it will be improper to say *dryness*.

Lastly, the *Peripatetick* description of dryness proves no less : *Dryness* is, whose subject is easily contained within its own bounds, but difficultly within anothers. Now unless there were water, within whose bounds it could not be contained, there could be no dryness, since that dryness is, whose subject cannot be contained unless difficultly within the bounds of water ; or Air either.

II. All elements and each of them are actuated by a respective, or relative form, that is, their being and conservation consisteth in a relation of a dependence from each other ; for instance, the earth is inconsistent of it self ; for through its incomprehensible *gravity* it would move to an *infinitum*, which is repugnant to its truth ; so that through its *pondus* it inclineth to the fire ; which again through its lightness benderh to it ; and so meeting one another, they embrace and constitute each other in their being. Well may Authors term their close and entire union a *discors amicitia*, or *amica discordia*, since their motion to each other is so fierce, and eager, that it doth as it were appear a fighting, or discord, but it tending to so mutual a good and benefit, proves the greatest friendship. But should coldness and heat be stated to be the form or first qualities of the Elements, they could not subsist one moment, because they are the greatest contraries, and therefore would not cease from their most incense hostility, before each were expelled from their common subject ; as we see plainly in water and fire.

III. This makes way to free water from coldness, to which it is neither but a privation of heat : For suppose there were a dish of water placed without the sphere of the elements, it would be improper to say, it were either hot or cold.

Neither is Moisture the first quality of water ; for water of it self (*per se*) doth not moisten any thing absolutely, that is freed from all mixture. I prove it : To moisten, is nothing else but to be thinly covered, or dash't over with water, or its vapours ; but water, when it is in its absolute state, is of so thick parts, that it is unapt to adhere to any thing. We observe that Quick-silver (or rather quick Lead, for so it is in effect) and melted Lead, although liquid, yet they do not moisten, because their parts are thick. By thick-

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ness I do not intend a depth of quantity, or of matter only, but such a depth of quantity that is not porous, or a crassitude, whose parts are diducted and drawn out into a continuity, and that throughout all its dimensions, and therefore through defect of tenuity doth not adhere to whatever is immerst in it: even so it is with water, which supposed in its absolute, or separated state doth by far exceed quick-lead in thickness, and consequently is unapt for humectation: but in the state wherein it now is, which is mixed and attenuated with much fire and ayr, it doth easily adhere to whatever body, that is dipt in it. This is the reason, why water in hot Countries doth sooner quench thirst, then in cold; or wine sooner then water; because the watery parts are more subtilized by the indivisibilities of fire, that are dispersed through them. Now water abates drought but little, because of its crassitude. Experience tells us, that one little measure of water acuated with Spirits of Vitriol, of Sulphur, or of Salt-Peter doth moisten the body, and abate thirst in a Feaver more then a Pint of water single, because the water is subtilized by the forementioned Ingredients. But Physicians vulgarly ascribe this effect to the penetrability of the admixtures; A blind reason: because water doth penetrate to the internals, therefore it moistens the more; this is not all; for suppose that water did penetrate, yet it would not moisten, because it doth not adhere to the parts, which it doth touch; wherefore it is only to be imputed to its subtilization. All which demonstrates, that water in its purity, that is, in its absolute state, doth moisten less then Quicksilver, which is not at all.

IV. The *Form* or first quality of water is *gravity with crassitude*. There is no single word I can think upon in any Language, that I know, full enough to express what I do here intend, and therefore am compelled to substitute these. I explain them thus: You must apprehend that *gravity* is a motion from the Circumference to the Center. *Levity* is a diffusion or motion from the Center to the Circumference. Now there is a gravity with density, that is, which hath density accompanying it. *Density* is a closeness of *minima's* nor diducted into a continuity, but *potentialiter*, (that is *Logicè*) porous, and such is proper to earth.

There is also a *gravity with crassitude*; which is a weight, whose parts are diducted into a continuity, or I might rather express myself, whose parts do concentrate, or move from the Circumference

to the Center with a continuity, that is, without any porential pores dividing its matter ; as in Quicksilver, diduct its body to the Circumference as much as you can, yet its part will concentrate with a continuity : but if you diduct earth, you will perceive its porosity, so that its body is altogether discontinued. Water is then weighty with a crassitude.

I prove it. First, that it is weighty, or that its parts move from the Circumference to the Center : Water when divided through force doth unite it self in globosity, as appears in drops, where all its parts, falling from the circumference close to their center, form a globosity.

2. Water doth not only in its divided parts concentrate, but also in its whole quantity. This is evident to them that are at sea, and approaching to the Land, they first make it from the top-mast-head ; whereas standing at the foot of it upon the Deck they cannot. The reason is, because the water being swelled up in a round figure, the top is interposed between the sight of those, that stand upon the Deck, and the Land-marks, as hills, or steeples ; but they, that are aloft, viz. upon the Yard arm, or top-mast, may easily discover them, because they stand higher then the top of the swelling of the water. The same is also remarkeable in a Bowl filled up with water to the Brim, where you may discern the water to be elevated in the middle, and proportionably descending to the Brim to constitute a round Figure. *Archimedes* doth most excellently infer the same by demonstration ; but since the alleading of it would protract time, and try your patience, I do omit it.

Lastly, The Stars rising and going down do plainly demonstrate the roundness of the water ; for to those that sayl in the Eastern Seas, the Stars do appear sooner then to others in the Western Ocean ; because the swelling of the water hindreth the light of the Stars rising in the East, from illuminating those in the West. The same Argument doth withal perswade us, that the earth is round, and consequently that its parts do all fall from the Outside to the Center.

V. Secondly, That water hath a crassitude joyning to its gravity, fight doth declare to us ; for it is impossible to discern any porosity in water, although dropped in a magnifying Glass ; which in Sand is not. Its levor or most exact smoothness expressing its continuity, & accompanying its weight, is an undoubted mark of its crassitude, whereas

whereas roughness is alwaies a consequent of contiguity and porosity. There is not the least or subtilest spark of fire or ayr can pass the substance of water, unless it first break the water, and so make its way to get through; this is the reason, why the least portion of ayr, when inclosed within the Intrailes of water, cannot get out, unless it first raises a bubble upon the water, which being broke, it procures its vent. Nor the least Atome of fire cannot transpire through water, unless it disrupts the water by a bubble, as we see happens, when water seeths: or disperse the water into vapours, and carry vapours and all with it. But ayr and fire do easily go through earth, because its parts being only contiguous and porous, have no obstacle to obstruct them: for sand, we see, in furnaces will suffer the greatest heat, or fire to pass through, without any disturbance of its parts. Lastly, Its respectiveness or relation doth require this form, both for its own conservation, and for others: For the earths relative form being to meet and take hold through its weight and porosity, (this porosity is necessary for admitting the fire within its bowels; for were it continuous, as water is, it would expel fire, and dead it) of the fire, and by ballancing its lightness to preserve their beings mutually, it needs the assistance of water, for to inclose the fire, when it is received by the earth, and through its continuity to keep it in, otherwise it would soon break through its pores and desert it. So that you see, that water by doing the earth this courtesie, preserveth herself; for were she not stayed likewise in her motion through the fire and ayr, she would move to an *infinitum*.

VI. *Moisture* is not the first quality or form of the ayr. I prove it. Moisture (as I said before) is nothing else, but the adhesion of a moyst body to another, which it doth affect, or touch. Now, in this moyst body there must be a certain proportion (or *Ratio substantia*) of quantity; it must neither be too thick, or too thin. Water therefore in its purity is unapt to moysten, because it is too thick; so ayr in its absolute state is too thin to adhere to any body, that it reaches unto. If ayr in its mixt nature, through which it is rendred of a far thicker consistence, is nevertheless not yet thick enough to adhere to the sides of another substance, much less in its purity. Who ever hath really perceived the moysture of Ayr? I daily hear people say, hang such a thing up to dry in the ayr; but yet I never heard any say, hang it up in the ayr to moysten, but wet it in the water. This drying Faculty of the ayr *Peripateticks* assert to be ac-

cidental to it, namely through the permixtion of exhalations with the ayr. Alas, this is like to one of their Evasions: Do we not know, that the ayr in its lowest region is rather accidentally moist, because of its imbibition of vapours, copiously ascending with the fire or heat, tending out of the water to its element? Is not the heat more apt to convey vapours, that do so narrowly enclose it, than earth, which of it self permits free egress to fire? yea where an Ounce of Exhalations ascends, there arises a Pint of Vapours. Waving this, I state the case concerning the second Region of the Ayr, or of the top of Mount iins, where according to their own judgment, neither Vapours, or Exhalations are so much dispersed, as to be capable of drying or moistning any extrinsec body; even here do wet things dry quicker then below, because the ayr here is much freed from that irrigation of waterish moisture, which the vapours contribute to the lowermost Region, as impelling all extraneous vapours and exhalation to a body. Moreover, I will give you a reason for it. To dry is to dissipate and disperse moisture or dampishness adhering to any substance; but the ayr being a most subtil body, doth through its subtility attenuate the water, which attenuated falls off from that body, whereunto it first hung, and is then imbibed by the ayr, which it doth afterwards detruce to its proper place. *Lightness with tenuity* is the form and first quality of ayr. What lightness is, I have set down before. *Tenuity* is a continuous expansion and diffusion into all dimensions. As water is weighty with crassitude, so contrariwise (as it were) is air light with tenuity. I prove that ayr is light, because all aerial bodies, as Cobwebs, Feathers, although they are complicated, yet being cast forth into the ayr, their parts are diffused from the Center to the Circumference.

Grease, Tallow, Oyl, Wax, &c. these bodies, because they do much participate of Ayr, when melted, and dropt upon the ground, do spread themselves into broad splatches, not contracting themselves like earth or water, into close round bodies, but rather contrariwise. Gunpowder, when kindled, Smoak, breathes of living Creatures, Vapours, Exhalations, Dust, &c. are all diducted from their Center to the Circumference, through the natural motion of the air inclosed within their bodies. The Ayr, if condensed (as they say, but improperly) is in a counter-natural state; for then it makes use of violence; ergo its diffusion to the Circumference is natural

to it. That the air is tenuous, or consisting of thin parts expanded in continuity into all dimensions, its rupture doth signify; for were it contiguous, every subtil, exhalation, or wind would not move it, but might easily transpire through its porosity without conculsing it; but it being continuous, is compelled to break; which rupture causes both its commotion, and sound. Hence it is that the least breath moves the air, and makes a sound in it. The reason why the water is moved, or at any time a sound is made in it, is, because it being continuous, is subject to ruptures, which disposeth it to both; but neither happens to fire or earth, because they are porous, and only contiguous. Lastly, Its being and preservation is impossible without this relative form: For through it the Ayr doth moderate, balance, and is subservient to it self and other Elements. Water is weighty with crassitude, and through its so being, it compasses the earth so narrowly, that the fire is unable of striking through its continuity for to meet the earth; wherefore Ayr being light with tenuity doth diffuse and expand the body of water, and so the fire is led to the earth by the conduct of the Ayr. Again, water being of that weight would move to an *infinitum*, and the lightness of fire is insufficient to stay it, because water is heavy and thick (and therefore contrary to fire, which is light and rare) and through that quality must necessarily expel the fire; wherefore air is requisite for to balance its weight, and having partly the same nature with water, and partly different (yet not contrary) is alone capable of mixing with the water. Ayr is partly of the same nature with water, because they are both continuous, and so do thereby immediately at their first conjunction pervade each other, and come to an exact union. This I will illustrate to you by an Example. Affuse Spirits of Wine to Water, you see they will mixe exactly in a moment; for you may presently after tast them equally at the bottom of the Glass, and at the top. Now, it is evident, that Spirits of Wine are very ayry and fiery, and therefore, because continuous, mingle instantly with the water. But fire refuseth to mixe with it, because it is contiguous and light, and altogether contrary as it were. It is different, because it moves to the Circumference, and water to the Center; Pray observe the wisdom of Nature: this is most necessary; for although they are both continuous, how could they mix unless the one did move to the Center, and the other from it, whereby they come to meet one another in an instant? Did they move

both to the Center, they could not mix or meet together; for being then supposed to be of an equal weight, that, which was undermost, would remain undermost; much in the manner of two Horses going both one pace, one before the other, about in a Mill, who will hardly meet, unless the one turns its gate, and go contrarily to the other, and so they do immediately confront one another. Hence it is that wine mixes quicker by far with water, than one kind of water doth with another. By this you may discern the absolute necessity of these motions in the Elements, both for mixture, and their mutual conservation.

VIII. The first quality of fire is *Levity with Rarity*. *Rarity* is a subtilty, or minority of parts, whereby its *minima's* are contiguous one to the other. Who ever doubted of the lightness of fire; Doth not fire diffuse its heat equally from its Center to the Circumference? Doth not the fire in a Torch cast its light circularly from its Center? That fire abhors a continuity, we perceive by its burning; for we see that the flames in Spirits of Wine do terminate into points, which points make a roughness, whereas were the fire continuous, its terms would be smooth, like unto those of Water and Ayr. Doth not the fire work through the smallest pores? *ergo* through its contiguous points. Hence it is that fire passes, where ayr is shut out. Its relative nature is constituted by its contiguity of parts; for through it, it is fitted for the embracing of earth; were it continuous and light, it would shun the earth; or if admitted into the earth, the earth would disrupt and expel it, like as it disrupts and expels Ayr. Wherefore through its porosity and contiguity it enters the earth, and the earth enters it, each opening its pores at this friendly reception: Nevertheless, supposing that contiguity had no contrariety to continuity, yet would the Ayr not be light enough to sustain the weight of the body of earth; besides, there must be two gravities conceived for one lightness, and two or three continuities for one contiguity; so that of absolute necessity a fourth Element must be added, that might be answering to the earths gravity and density, through its levity and rarity. That, which is light and rare, is more vibrating, and by far of greater activity and energy, than that, which is light and thin. Summarily, let us take a view of all their first qualities, and compare them together. Water and Ayr do communicate in a perfect friendship, and so doth Earth and Fire; water and earth, ayr and water, fire and ayr,

ayr, are all beholding to one another, yet not in the same respect, but divers. Water and Fire at an immediate contact are absolutely disagreeing, but mediately accompanying other Elements, prove good friends; the same Law is between Earth and Ayr. Observe, although I have explained their forms by more words than one, yet apprehend that in their sense they move a single concept. Levity with Rarity is really distinct from Levity with Tenuity; their operations, and manner of operating being also different; for Levity with Rarity is more penetrating, vibrating, and of a stronger force; and therefore Fire exceeds the Ayr in Levity. The like is to be understood of the Earth and Water: to wit, that the former is more weighty than the latter. These concur equally to the constitution of one another, of the world, and of its parts; the one contributeth as much as the other, and therefore they are of an equal dignity, and time.

CHAP. IX.

Of the Beginning of the World.

1. *Whence the world had its beginning. What the Chaos is. That the Chaos had a Form. A Scripture Objection Answered. That the Spirit of God moving upon the face of the waters did informate the Chaos.*
2. *That the Chaos consisted of the four Elements, is proved by Scripture. The Etymology of Heaven. What Moses meant by Waters above the Waters. The Derivation of the Firmament. That the Ayr is comprehended under the Notion of waters in Gen.*
3. *That the Elements were exactly mixt in the Chaos. That all the Elements consist of an equal number of Minima's.*
4. *That none but God alone can be rationally thought to be the Efficient of the Chaos. How this Action is expressed in Scripture.*
5. *What Creation is. Thom. Aq. his Definition of Creation disproved. Austins Observations of the Creation.*
6. *That God is the Author of the Creation, proved by the Testimonies of Scripture, of Holy men, and of Philosophers.*
7. *An Explanation of the Definition of Creation, Whether Creation is*

an emanant or transient Action. Creation is either mediate, or immediate. Scotus his Error upon this point. The Difference between immo and medietas. Wherein mediate Creation differs from Generation.

8. Of the Place, Magnitude, tangible Qualities, Colour, Temperament, Time, Figure, Extent in Figure, Duration, Quantity, and Number of the Chaos.

Thus much shall suffice concerning the Matter and Form of the Elements, as they are considered supposedly separated from each other; but notwithstanding are the Particulars last insisted upon really in them *primatio & per se*. Now let us proceed. Since these Elements are perfections, and as it were forms to each other, the one being constituted, doth suppose them all to be constituted; and but one of them being abolished, they are all abolished. Wherefore it is a simple question to demand, which of the Elements we could best miss, or which of them is most necessary for the preservation of life, they being all of an equal necessity?

I. The first formation of the world took its Original from the creation of a *Chaos*: which that it did, hath been demonstrated in one of the precedent Chapters.

Hence
2d from
2do fundo,
five confun-
do.

The *Chaos* is a great and vast natural body, consisting of an exact mixture of all the four Elements: It is generally explained to be a Confusion of all the Elements. Hereby confusion is not meant an imperfect mixtion; but it is called a confusion, because it is an universal mixtion of all the Elements. The *Chaos* was a natural body, because it was constituted by the natural Matter and Form of all the Elements. That it had matter is little doubted of by any, all derived natural substances being thereout materiared. But a form is not so universally allowed to it; *Moses* telling us in the first Chap. of *Gen.* That the Earth was without form. For the reconciling of this, you must know, that a form is not alwaies taken in the same sense. A Form is sometimes taken for the compleat and last perfection of a thing; so we say, that the confusion of genitures in marriage is rude and hath no form, that is, it hath not that compleat, further, and last perfection and shape, which is intended in it.

2ly. Form is more commonly taken for that, which giveth specification and distinction to Matter, or that, whereby a thing is that, which it is; so as in this acception the *Chaos* of the *Microcos-*

mus is termed not to be without a *form*, neither is the *Chaos* of the *Macrocosmus* void of form; although in the former sense it is.

I prove it. The *Chaos* was either a thing, or nothing. It was not nothing, for the Text mentions it consisted of Heaven and Earth. Was it a thing? *ergo* it must have had a form to be that thing, which it was, or to be distinguished from nothing. It was not only distinguished from nothing, but also from an *infinitum*, and from a single essence, it consisting of Heaven and Earth, which constituted both a *finitum* and a *compositum*: But all distinction derives from a form; *ergo* it had a form.

Further, the Scripture doth reveal to us, that the *Spirit of God* moved upon the face of the waters, and what was the *Spirit of God* here, but the form of the *Chaos*? Again, the *Spirit of God* moving upon the waters doth evidently confirm my former Assertion, namely, that the form of the Elements is nothing else, but a local moving virtue impressed by Nature, that is, God, upon their Matter.

II. That the whole Clot of each Element contributed to the Matter and Form of this first created body, the same Scripture makes clear to us in enumerating them distinctly, *viz.* Chap. 1. 1. *In the beginning God created Heaven and Earth. And the Earth was without form, and void, and darkness was upon the face of the deep; and the Spirit of God moved upon the face of the waters.* First, you see here is Heaven, comprehending fire and air; for as I proved before, *ayr* cannot exist without fire, nor fire without air. Secondly, Both these being near companions and relations, the Text comprehends them in one: for if you observe, the Scripture doth all along in this Chapter enumerate the Elements by paires (as it were) under one name, because of their near affinity: So by the deep is meant Earth and Water (strictly or properly so called) and by waters the two fluid Elements, which are those, that before are explained to be continuous Elements. That this is the genuine Interpretation of the said divine Text, the ensuing words do clearly make it out; for in *v.* 6. God saith, *Let there be a Firmament in the midst of the waters, and let it divide the waters from the waters*: Here the water and *ayr* being both alike in fluidity, and confused together, are both called water: The *ayr* then being light, and the water weighty, God expanding them, the *ayr* through its lightness heaved up from the water, and thence constituted a part of Heaven, as the Text hath it in *v.* 8. The water through its weight descended under the

the ayr, and thence it is called in v. 9. *the waters under the heaven*. This must necessarily be so; for water, strictly so named, had it been heaved up, it would have been against its first nature, and been moved violently, which is improbable, since that (*nullum violentum est perpetuum*) no violent motion is lasting. The nature of air certifieth us, that it must be it, which moved above the waters under it. Lastly, The *waters above the waters*, strictly so termed, are called the *Firmament*; from its firmness; because they are as a deep frame, or a strong wall about the waters underneath, for to keep them together in a counterpoise, from falling to an *infinitum*: but it is air that is above the waters, and is a Firmament to them; *ergo* the ayr must be comprehended under the Notion of waters. Or thus רָקִיעַ in the Hebrew is by the *Rabbi's* and *Hebrews* expounded, an *Expansion*, or thing expanded: for its Root is פָּרַע to *attenuate*: if so, then by the waters above must be implied ayr, whose nature it is to be expanded, as I shewed before. So whether you take the word according to the interpretation of the *Septuaginta* *ἐπερωμα*, *Firmament*, or of the *Rabbi's*, *Expansion*, there can be nothing else intended by it but ayr. I say then, as by *waters*, a duplicity of Elements is implied, so by the *Heavens*, ayr and fire are implied: I prove it: Light is fire flaming; but the light was drawn from the *Chaos*; if from the *Chaos*, *ergo* not from the earth; for by earth there is only meant earth single; but from the Heaven, which imports a conjunction of Elements, *viz.* of Ayr and Fire. Secondly, Is light, being a flaming fire, drawn from the Heaven; *ergo* there was fire, latent in it: So let this serve to answer *Van Helmont* his Objection, who denieth fire to be an Element, because its name is not set down in the first Chap. of *Gen.* neither is ayr mentioned among the Elements in so many Letters, yet it is comprehended among them. 'Tis true, Fowl are called Fowl of the ayr; but, what of that? this doth not infer that ayr is an Element, because Fowl are named Fowl of the Ayr.

Secondly, Earth and Water are there expressed in so many letters, *ergo* the *Chaos* was made up of all the four Elements.

III. The Elements in the *Chaos* underwent an exact mixture; because each being a stem and perfection to the other, they required it: for had they been unequally mixt, then that part which had not been sufficiently counterpoysed by its opposite Element, would have fallen from the whole. Hence it followeth, that they must have

have been of an equal extent and degree in their first vertue or quality, and not only so, but also in their quantity; that is, they consisted all of an equal number of *minima's*, that so each *minimum* of every Element might be fitted, sustained, and perfectionated by three single *minimum's* of each of the other Elements. Now was there but one *minimum* of any of the Elements in excess above the other, it would overbalance the whole *Chaos*, and so make a discord, which is not to be conceived. But here may be objected, That the earth in comparison with the heavens, beares little more proportion to their circumference, then a point. I confess that the air and fire exceed the earth and water in many degrees, but again, as will be apparent below, there is never a Star which you see, yea and many more then you see, but contains a great proportion of earth and water in its body, the immense (to our thinking) Region of the air and fire are furnished with no small proportion of water and earth: so that *numerus est numerandis*, the earth and water are not wanting of a *minimum* less then are contained either in the fire or ayr.

IV. The efficient of this greatest and universal body, is the greatest and universal cause, *the Almighty God*. I prove it. The action, through which this vast mole was produced, is infinite; for that action, which takes its proceſſion *ab infinito ad terminum finitum*, *sive a non ente ad ens*, from an infinite to a finite term, or from nothing to something, is to be counted infinite; but an infinite action requireth an infinite agent; therefore none but God, who is in all respects infinite, is to be acknowledged the sole cause, and agent of this great and miraculous effect.

It was a Golden saying upon this matter of *Chrysippus* the Stoick, *If there is any thing, that doth effect that, which man although he is indued with a reason cannot: that certainly is, greater, mightier, and wiser then man; but he cannot make the Heavens: Wherefore, that which doth make them, excels man in Art, Counsel, and Prudence.* And what saith *Hermes* in his *Pimand*? *The Maker made the universal world through his Word, and not with his Hands.* *Anaxagoras* concluded the divine mind to be the distinguishinger of the universe. It was the Saying of *Orpheus*, That there was but one, born through himself, and that all other things were created by him. And *Sophocles*, There is but one true God, who made Heaven and the large earth. *Aristotle*, Lib. 2. *De Gen. & Cor.* c. 10. f. 59. asserts God to be the Creator of this Universe. And Lib. 12. *Metaph.* c. 8. He attests

Ggg

God

God to be the First Cause of all other Causes.

This action is in the holy texts called *Creation*, Gen. 1.1. Mark 10.6. Psal. 89. 12. Mal. 2.10. *Creation*, *xlous*, is not alwaies intended for one and the same signification; sometimes it implying the Creation of the world, as in the Scriptures next forementioned; other whiles it is restricted to Mankind, Mark 16.15. Mat. 28.19. Luke 24. 47. In other places it is applied to all created beings, Mark 13.19. Gen. 14.22. Job 38.8. Prov. 20.12.

כרא *To create* is imported by divers other Expressions.

1. By **רער** *To Form*, Gen. 2.7. Esay. 43.7.
2. By **עשה** *To make*, Gen. 1.31.
3. By **רסד** *He hath establisht*, Psal. 89.12. Psal. 104. 5. Mat. 13.35. Heb. 6.1. 1 Pet. 1.20.
4. By **בכצה** *To stretch or expand*, Psal. 10. 2. Es. 42. 5.
5. By **ברו** *To prepare, or dispose*, Prov. 8.27. Psal. 74.16.

V. *Creation is a production of a being out of, and from nothing.* Tho. gives us this Definition in *Sent. 2. Dist. 1. Quest. 1. Art. 2.* *Creation* is an emanation of an universal Being out of nothing. By an universal being, he intends a being, as it comprehends all material and immaterial beings. So that this is rather a definition of the creation of the material and immaterial world, then a definition of the Formality of Creation. 2. His Definition is defective and erroneous; for he adds only *out of nothings*. This is not enough, it being possible for a thing to emanate out of nothing, and yet not be created: the immaterial operations of Angels and rational Soules emanate out of nothing, because they do not emanate out of matter, and yet they are not created, but naturally produced. 'Tis true, although they emanate out of nothing, yet they emanate from something, to wit, from their immaterial Essence: and therefore they are not to be judged to be created. It is also possible for a thing to be created from nothing (*a nihilo sui*) and yet out of something; so are all beings created that are created by a mediate creation. Wherefore my *Definition* hath an immediate creation to its *definitionum*. Now if you would define creation, as it doth in a large extent comprehend also a mediate creation, 'tis only to substitute in the room of, *and from nothing*, or from nothing: thus creation is a production of a being out of, or from nothing, or from and out of neither.

Austin

Austin, Lib. 11. *de Civitate Dei*, c. 21. commends a threefold Observation upon the Creation.

1. Who is the Efficient of it ; and that is God.
2. Whereby, or through what he proceeded to Creation ; through that he said, *Let there be* ; and all things were.
3. For what reason, because he is good.

We read something not unlike to this in *Diog. Laert.* Lib. 7. The *Stoicks* (saith he) state two Principles of things, an *Agent*, and a *Patient*. Through an *Agent* they understood *Matter* ; and through a *Patient*, the *Word of God*, which did adorn that *Matter*.

That God is the Author of the Creation, besides the reason fore-given, the Testimonies of the Sacred Bible, of holy men, and of Philosophers, do confirm it to us.

Psal. 102. 25. & 147. 9. *Mal.* 2. 10. *Es.* 45. 6, 7. *Job* 9. 8. *Jer.* 10. 12. & 51. 15. *Job* 26. 13. *John* 1. 3. *Col.* 1. 16. *Rom.* 13. 36. *Rev.* 4. 11. *Heb.* 1. 2.

That creation is the production of a being out and from nothing, the Scripture doth also reveal to us. *Gen.* 1. *Prov.* 8. 24. *Psal.* 33. 9. *John* 1. 3. *Rom.* 4. 17. *Heb.* 11. 3.

Austin Lib. 1. *De Gen.* contra *Manich.* *Although all things are formed out of that unform matter, notwithstanding is this same matter made out of nothing.*

Lactan. Lib. 2. Cap. 9. Let none ask out of what matter God made so great and wonderful works ; for he hath made all things out of nothing. Neither are we to give hearing to Poets, who say, that there was a *Chaos* in the beginning, that is, a confusion of things. and of the Elements, and that afterwards God did divide all that Mass, and having separated every thing from the confused heap, and described them in order, he did build the world, and also adorn it. 'Tis more credible, that matter was rather created by God, which God can do all things, then that the world was not made by God, because without a mind, reason, counsel, nothing can be made. Here our Author reasons against the Eternity of the *Chaos*, as the Poets feigned to themselves : whose Song was, That the *Chaos* being an immense, rude, and voyd mole, did fluctuate without any form from all eternity, and that God in time did confer a form and shape upon it, and brought it to what it is. Yet nevertheless he states a finite *Chaos* under the name of matter, created by God out of nothing.

Hemings teacheth us, That creation is the primar production

or formation of things, whereby God the Eternal Father of our Lord Jesus Christ, together with the Holy Spirit did produce and form Heaven and Earth, and the things therein contained, both visible and invisible, out of nothing, to the end that he might be acknowledged and worshipped.

Hermes Trismegistus, Lib. 1. *Pimandr.* That ancient *σοφος*, declares himself (seemingly) more by inspired words than acquired ones. *The mind* (saith he) *of the Divine power did in the beginning change his shape, and suddenly disclosed all things, and I saw all things changed into a light, most unspeakably sweet and pleasant.* And in another place, *Serm. 3. Pimandr.* *The infinite shadow was in the deep: and the water and thin spirit were in the Chaos: and the holy splendor did flourish, which did deduct the Elements from under the sand, and moist nature, and the weighty lay drowned in darkness under the moist Sand.*

The same divine *Mercurius*, Lib. de *Piet. & Phil.* renders himself thus; *πρώτον ὁ θεός: δεύτερον ὁ κόσμος: τρίτον ὁ ἄνθρωπος: ὁ κόσμος, διὰ τὸ ἄνθρωπον: ὁ ἄνθρωπος διὰ τὸ θεόν.* *The first is God; the second the world; the third man: the world for man: and man for God.*

Another Philosopher speaks with no less Zeal and Eloquence. *ἀρχαῖος τις λόγος καὶ πάσης ἐστὶ πᾶσιν ἀνθρώποις, ὡς ἐν θεῷ τὰ πάντα καὶ διὰ θεοῦ ἡμῖν συνέστηκε, ἐξελίξα ὅφρ' αὐτὴν αὐταρχῶς ἐρημῶς θέσται ἐν τῇ σωτηρίᾳ.* It is an old saying, and revealed by the ancients unto all men, that all things were constituted out of God, and through God: and that no nature can be enough accomplished to salvation, were it committed to its own tuition without Gods help.

Thales being sometimes demanded, what of all things was the most beautiful? he answered, the World; for it is the work of God, which nothing can exceed in beauty.

Plato in *Tim.* attested Gods Love to be the cause of the making of the world, and of the rise of all beings.

Clemens Alex. said, that the Creation of the world was Gods Hand-writing, whose Leaves were three: Heaven, Earth, and the Sea.

VII. The *Genus* of the Definition is *Production*, which is either supernatural or natural. A supernatural Production is called *Creation*: A Natural one is termed *Generation*. Observe that *supernatural* and *natural* are remote differences of *Creation* and *Generati-*

on;

on; wherefore I did not appose the foremost of them to our Definition, because I substituted its *differentia proxima*.

Whether Production, by others called Efficiency, is an emanant or transient action, is controversial. *Thomas*, as you have read, terms it an emanation. On the other side, why should it not be conceived to be a transient action, since it doth *terminare ad extra*? But then again why so? For all transient actions do presuppose the pre-existence of their Object, which here was not. Wherefore to avoid all scruples, I conclude it (if actively understood) to be apprehended *per modum actus emanantis*; if passively, *per modum actus transiensis*.

Creation is either so called strictly, and then it imports only an immediate creation, according to which sense you have it already defined: or largely, and then it is divisible into immediate or mediate Creation.

An immediate Creation is the same with Creation in a strict sense, whereby a being is produced out of nothing; neither out of a pre-existent, or co-existent matter: but *a nihilo termini, i. e. forma, vel materia: sive e nihilo privativo, vel e nihilo negativo*. Wherefore I say, that this immediate Creation is no mutation, because mutation presupposeth pre-existent matter. But it may be you will side with *Duns*, who for to maintain it to be a mutation, did impiously assert the thing, which was to be created, (*res creanda*) to have had its essence pre-existent in the divine mind: so that creation must be the mutation of an Essence not existing, into an Essence existing.

In the first place, Scripture doth plainly contradict him.

2. He did mistake the nature of Essence and Existence, as further appears out of my *Metaphysicks*.

3. It infers an absurd Definition of Creation, to wit, that it is the mutation of a being *a non esse accidentali ad esse accidentale*, & consequently an accident only is produced *de novo*, and not a Substance.

4. That the essences of things are eternal; a great absurdity. I grant they are from all eternity, that is, from an eternal being.

5. Did God contain the essences of things in himself; it followes, that he also contained their matter in himself; a great Blasphemy.

A mediate

A mediate Creation is the production of a being *a nihilo termini, vel forma, sed ex aliquo materia: a nihilo forme, supple ultima*. This kind of Creation is expressed by two different words. *creare*, and *condere*. *creare* or making, is whereby God created a being *ex aliquo materia, sed a nihilo forma ulterioris*. In this sense did God create the Fishes and Fowl. *condere*, or an artificial formation is, whereby God formed man also *a nihilo forma ulterioris*.

Mediate Creation differs from Generation, through that thereby a form is introduced in an instant: hereby successively by a preceding alteration.

2. Thereby a being is constituted *a nihilo forma ulterioris*: hereby *ab aliquo forma ultima, tanquam a termino a quo*. That is effected by the immediate causality of God; this by a mediate one.

VIII. The *Chaos* being so equally mixed and balanced abided in one place. The place, which did contain it, was not corporeal; because it would have been needless, since its own balance did sufficiently preserve it in its own internal place.

Its magnitude was equal to the present magnitude of the world: For although through its expansion and opening, the fire and ayr were heaved up, yet they were heaved up no further then the weighty Elements descended: so that what space was left by the one, was taken up by the other: but had there been a *vacuum* left by any of their egressions, then indeed it must have possessed a larger place.

As for the tangible quality which it had, it must needs have been soft; because it being tempered *ad pondus*, could acquire no other then a temperate one, and such is soft.

Colour it had none *ex accidenti*; because there was no light to discern it: nevertheless that doth not hinder but that it had a fundamental colour in it self; which must have been red, that being the only colour issuing out of a *temperamentum ad pondus*.

Tast is also detracted from it *ex accidenti*, but in it self it must have been sweet for the same reason.

We cannot ascribe any smell to it *per se*; because being close shut, or not yet opened, none can grant that it could have affected any supposed smell, since it could not have emitted any Exhalations from it.

That it had a finite time, Scripture testifieth, *Gen. 1. 1. In the beginning, &c.* but the beginning is a distinction, and Note of finite

nite time; *Ergo*. Reason proves no less. That which was finite in all its other modes, could not be capable of one single infinite mode: But such was the *Chaos*, and such is the world now; *Ergo*.

Whose parts are subject to a beginning and ending, its whole must also have been subject to the same: But our daily experience confirms to us, that all things are subjected to a beginning and ending; *Ergo*.

Its figure is round we know from the form of the Elements. Besides rotundity is a figure of the greatest, equallest, and perfectest extension; but such is most futable to the greatest, equallest, and perfectest body; *Ergo*.

The *Chaos* was also finite in its globosity and extent of parts. I prove it. The compleated world being finite in its globosity and extent of parts, doth necessarily infer the finiteness of the *Chaos* in the same particular; because the compleated world was framed out of it. Now that the world is terminated in magnitude, the circumvolution of the *Aplane* and the Planets in a finite time, to wit, in 24 hours, doth certainly demonstrate; for were the world infinite in magnitude, they must then also require an infinite time to rowl round about it; the contrary of which is doubted by none.

Here that trite Axiom may be objected *qualis causa, talis effectus*. Such as the cause is, such also is its Effect: But God is an infinite cause; *ergo* his effect, namely the world must also be infinite.

I answer, That this Maxim holds only in *univocis*, and *naturalibus*, but not in their opposites.

2. It is a Character of Gods infiniteness, that he can act finitely and infinitely; for could he act only infinitely, then might he be supposed to act necessarily, which is a note of finiteness and limitation in a cause.

3. The action, whereby he effected this finite work, is infinite, as I have observed before, wherefore in this he acteth both finitely and infinitely.

And since I am about answering Objections, it will not be amiss to insert some objected by *Bodinus*, in *Theatr. Nat. and Casertan*, against the pre-existence of the *Chaos* before the compleated world.

1. *Ecclcs. 18. 1.* Where God is said to have created all things at once; *Ergo* there was no pre-existent *Chaos*.

I answer,

I answer, that Creation here doth imply an immediate creation, through which God created the matter of all things at once.

2. They resume the words of *Austin*, asserting, that to God there is nothing before or after another, no past or future time, but that all things are like as it were in one moment, filling that, which hath a most perfect being. Wherefore say they, *Moses* did distinguish the Creation into several sections and divisions, to accomodate things created in an instant, to our capacity.

I answer, That had *Moses* writ, that God had created all things in a moment, we could have understood him as plainly as he hath writ otherwise; for we know that Scripture contains many harder sayings then this would have been. So that it is a great levity in them to retort the genuine sense of sacred words to their oblique brow. As for that of *Austin*, it hinders not, but that all things past, present, and future, are as in an instant to God, and yet to us may be past, present, and future.

The *Chaos* is not only finite in duration and continued quantity, but also in discrete (as they term it) quantity or number. Its quantity is the least and the greatest: it is the least in discrete quantity; for there was but one *Chaos*. 2. But the greatest in continued quantity. The proof of these depends reciprocally from one another. The *Chaos* is but one, because it is the greatest; were there then more then one *Chaos*, but two, three or more, or infinite, it could not be the greatest, but part of the greatest, and so the whole must be greater then the part: on the other side, it is the greatest, because it is but one.

2. Were there more then one, all the others would be created in vain, because the *Chaos* being the greatest, is sufficient to produce a thousand worlds; for otherwise it could not be said to be the greatest.

3. Or thus in other terms: The *Chaos* is an universal quantity; but were there more then one, it could not be universal,

4. Unity is the beginning and root of all plurality: but the *Chaos* is the beginning and root of all plurality of bodies; ergo it is but one.

5. The Scripture mentions but of one *Chaos*, Gen. 1. 1, 2.

6. The *Chaos* is eval naturally, like as the soul of man is eval, and also immortal. Eval, that is, of sempiternal duration, yet counting from a beginning. I prove it. *Eccles. 12. Let the dust return to*

its earth, and the spirit return to God who gave it. Here the body first returns to dust, thence to earth, but not to an annihilation; for then the Scripture would have mentioned it. *Eccles. 1. 4.*

2. The *Chaos* is to remain, were it but to retribute the matter of humane bodies, in order to their Resurrection.

3. Annihilation is the greatest defect or imperfection; for it supposeth an imperfect Matter and Form, which cannot be imagined to be immediately created by God. 4. Goodness lasteth for ever; but the *Chaos* was good, *Gen. 1. 31. 1 Tim. 4. 4.* Ergo.

5. Should the *Chaos* be annihilated, then God would have created it in vain: But that is impossible; Ergo.

CHAP. X.

Of the first Division of the *Chaos*.

1. *Why the Chaos was broken.*
2. *That the Chaos could never have wrought its own change through it self. The Efficient of its mutation.*
3. *The several Changes, which the Chaos underwent through its disruption. The manner of the said Disruption.*
4. *How Light was first produced out of the Chaos. What a Flame is.*
5. *A perfect Description of the first knock or division of the Chaos. By what means the Earth got to the Center, and how the Waters, Air, and Fire got above it. Why a Squib turns into so many whirles in the Air.*
6. *The Qualifications of the first Light of the Creation. A plain demonstration proving the circular motion of the Heavens, or of the Element of Fire to be natural, and of an Equal Duration.*

1. IT was an Elegant Expression of *Clem. Alex. Lib. 3. De Recogn.* Like the shell of an Egge, although it seemeth to be beautifully made, and diligently formed, nevertheless it is necessary, that it should be broken and opened, that the Chicken may thence come forth, and that that may appear, for which the shape of the

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whole

whole Egge seems to be formed : Wherefore it is also necessary , that the state of this world do pass, that so the more sublime state of the Heavenly Kingdom may appear in its brightness : The same I may aptly apply to the *Chaos*; that it is to be broken and opened, that so a more glorious substance may thence appear, and come forth.

II. One Substance can have but one first power or vertue of acting; and therefore the *Chaos* having no more , could not act any effect, but which it did act, and so had no principle of changing it self from that which it was, and consequently would have remained in that shape for ever. For this reason we must grant, that the Creative power and universal efficient wrought a mutation upon it. This mutation was gradual *a perfecto ad perfectius*. It was not by way of *creation*, or creation of the first manner, but of a *reformation*, or as *Moses* sets down, through that he said, *fiat, let there be*; and this was the Note of the mediate Creation. The manner, as we may best conceive to our selves, was by expansion, division, or opening of the *Chaos*.

III. Through the first diduction and opening, the Fire and Ayr being light Elements, and so entirely knitted into one, must necessarily have diffused themselves above the superficial weighty Elements, these falling nearer to the Center. The fire having hereby acquired a greater liberty, and more force, by being less oppressed by the water, its contiguous parts were notwithstanding united and suppressed through the continuity of the ayr, and conveyed a great part of earth and water with them; the ayr also could not be detracted from the universal mixture without the adherence of some water and earth; wherefore that appeared also very thick.

IV. The fire being the lightest, and of most activity towards the Circumference, must have been vented in the greatest quantity, yet not (as I said) without inflated ayr, which united to the vibrating parts of the fire, were both changed into a flame: A Flame is a splendid heat (*Flamma est calidum splens*;) wherefore by this two new qualities were produced, to wit, heat and splendor. By (*Calidum*) heat, understand a red hot fire. (*Ignis candens*;) Fire is named candent, *quod candorem efficiat*, because it begetteth a candour, that is, the brightest light. But how fire became at once through this division burning and candent, I shall distinctly evidence hereafter.

V. Through

The Representation of the *Chaos* after its first Division.



V. Through this concussion the waters being also somewhat freed from the *minima's* of the earth, tending to the Center, were continued a top of the earth, like unto a fleece or skin; for the points of the earth, which did before discontinue the water being through their more potent gravity descended, the water getting a top, must needs have acquired its continuity, which (as you have read before) is the first quality of water. The water therefore got above the earth, not because it is less weighty *per se*, but *per accidens*, through its continuation.

The flame of the first division was yet thick and reddy, not exalted to that brightness, which afterwards it was.

The heat of this division was hot in the first degree, because there was not yet so much fire drawn out as to make a greater heat.

This flame I may compare to the flame of a torch or candle, which is either but newly lighted, or near upon going out; the heats, which these flames then cast forth, are in reference to their highest state (as it were) but in the first degree. Their light is a dusky red. The first motion of this fire being to diffuse it self to the circumference of the ambient ayr, is there arriving, beaten back and reflected through the external surface or coat of the ayr; not through the thickness of it; for no doubt that was rather thinner there then below, but through its own natural motion, whereby it moves to its preservation; for a flame cannot subsist but by the help and sustenance of the ayr. If so, whither can it move? not directly back again, retorting into it self, that being its extream contrary motion; but rather to the sides, moving circularly about the surface of the ayr, in the same manner as fire in a roofe Furnace, where we see it first diffuseth its self directly towards the Circumference of the Furnace, and beating against the Roof of it, doth not reverberate into it self, but reflects to the sides, and so moves along circularly about the sides of the wall, which doth more evidently appear in a globous Furnace (*Fornax reverberatoria.*) The same is also manifested by the fire of kindled Gunpowder in a Squib, which thickneth the ayr by impelling the Vapours and Exhalations therein contained one upon the other, and augmenting them by its own fumes, is almost every way resisted and beaten back, whence therefore we observe it betakes it self to a circular motion: The reason is, because through a circular motion it is less resisted; for one part of it preceding the other, doth not stop the following parts, but rather

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one part draweth another after it, or bears another before it, and moving alwaies round, it never meets with any other resistance; for the one part is gone, before the other can overtake it: or what should resist it? It is just like unto two horses going both one pace round in a Mill, the one can never be a stop to the other, but rather the one draweth the other after him, because they move both one way. Was this motion any other but circular, it would meet with resistance. This motion is, as it were, natural to the fire, and therefore is also of an eual duration; for its nature is ever to move from the Center, which it doth in moving circularly, not primarily, but secondarily, it moving first directly to the Circumference, and thence reflecting to the sides, it creeps (as it were) all about the surface of the ayr, one part drawing the other after it, or pushing and thrusting it before it, or both waies. Did not the fire continue in motion, it would soon lose its flame: for the flame is continued by being united; that which unites it, is, besides its own motion, the crassitude of the ayr, which the fire impelling one part upon the other, renders thicker, and so unites it self the more. So that in all Particulars this motion is natural to the fire, & necessarily of an eual duration, because the said motion preserves it in its being, and is its proper nature. Now were this motion the effect of heat, it must be violent, and consequently of no long duration; for what is violent, destroyes the essence of a being. It would be violent, because heat is produced by a violent cause from without, namely the opposition of the ayr. 2. We read of no burning heat in the *Misajick Philosophy*, but only of a moving spirit, which is that I call fire, or at least an effect impressed upon part of the *Chaos*, by which it moved to the surface; for you read that this moving vertue was upon the face of the waters, before there was light, that is, it was drawn out from the *Chaos* before it could raise a flame to give light. What can be more plain? Lastly, it was necessary that the Elements should be of an eual duration: for they were created to exist the same duration, which *Adam*, had he abided in his primitive state of Innocency, would have existed. By all which it appears, that there is no other Principle, whence its eual duration is deducible, but from hence.

CHAP. XI.

Of the second Division of the *Chaos*.

1. *An Enarration of Effects befalling the Elements through the second Knock. The proportion of each of the Elements in their purity to the Peregrine Elements.*
2. *The ground of the forementioned proportion of the Elements.*
3. *That fire and ayr constitute the Firmament.*
4. *A grand Objection answered.*

I. **L**Et us pass to the second Division, and speculate the effects of that. Through this vibration did the earth yet more concentrate, and the waters gulped also upwards equally from all parts: for (as I said) the *Chaos* was equally mixt, otherwise how could the waters equally cover the earth, as they did? the waters being got atop, the ayr got loose in a far greater measure then it did before, which being expanded, constituted this great tract of the air, which now we breath into. This breach, although in a manner agreeable to the absolute propension of fire and ayr, could not, since they were so exactly mixed with the weighty elements, but give occasion of conveying a greater proportion of both with them. Neither was that little remaining bowl of the great mole, whereon we now tread, destitute of all her former adherents, there still being immerst in her the same proportion of the light Elements to the weighty, as there is a proportion of weighty elements attending the separated light ones. Consider now the proportion of each to it self.

1. Although the earth doth harbour some of the other Elements in her, yet she is triumphant over them in the fourth degree, that is, there are three parts pure earth to one part of the others; and amongst these others, that constitute a fourth part in her own bowels, it is to be conceived, that water doth transcend the ayre, and so the ayre the fire. Supposing then the earth to consist of 64 parts, 48 thereof are pure earth, 6 $\frac{1}{2}$ pure water, 5 $\frac{1}{2}$ pure ayr, and 4 $\frac{1}{2}$ fire. Hence from its predominance it is called earth, and so the like of water, ayr, and fire: to wit, water reserves 48 parts of pure water, 5 $\frac{1}{2}$ of ayr, 5 $\frac{1}{2}$ of earth,

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5 of fire. Ayr is called ayr also from its greater predominance over the other elements, not from its purity, as if it should be all pure ayr, that is impossible. Its purity appropriates 48. water and fire each $5\frac{1}{2}$, earth 5. Fire is pure in 48. ayr in $6\frac{1}{2}$, water in $5\frac{1}{2}$, earth in $4\frac{1}{2}$. The proportion of these forementioned elements, take thus: 64 parts is the whole, three fourths of it, which are 48, denote the proportion of each element in its purity. Then there remains 16, which is the last fourth, signifying the proportion of the admistred elements to the principal element, as it is considered to be in its purity. Again, there is another proportion observable among the perigrine elements, as they are sharers of the last fourth, which is 16. Wherefore in earth 6 parts and a third is taken up by water, one less, to wit $5\frac{1}{3}$ by ayr, and also one less, namely $4\frac{1}{3}$ by the fire. In water five and a half is equally attributed to earth and air, one less (that is, the overplus fraction of each compleat number of earth and air makes socially one more) to fire. The last fourth or 16 of the air is supplied in five and a half by each of the ingreſs of fire and water, In five by fire. Fire is tied to $6\frac{1}{2}$ of ayr, $5\frac{1}{2}$ of water, to $4\frac{1}{2}$ of earth.

II. The ground and reason of this proportion is, 1. That the least predominance, whereby an element may acquire its name, must be triple, that is, thrice as many times more in quantity, then the elements affixed to it: for did an element in its purity overbalance the others but in two parts, then it could hardly retain a form, whereby its nature might be sufficiently distinguishd from the others; if in more then in three parts it would be apparently discernable that that element was mixed; if so, then it must also be denominated by a mixed name; for the cause, why men generally impose a single name upon some beings, that are mixt and compounded, is, because there is so little of the extrinſick body discernable, that it doth not deserve to be named: but if discernable, then a compounded word is applied: for instance, there is none would say, that water whereinto only a few drops of wine were instilled, was wine and water, or *Oinolympha*: but they would nominate it water alone, because there is so little wine in it that it is not gustable; but supposing there were so much wine mingled with water, as to make it perceivable, either by tast or smell, then no doubt they would say it was wine and water. Even so it is here; was there more then a fourth part of extrinſick Elements admitted

to a single pure element, it would be perceptible: if so, then we should not nominate the elements by a single name, but by a compound one. Now that it is not perceptible is evident; for who can perceive water, ayr, or fire in the earth? or who can distinguish water, earth or air in fire? &c. Was there less then a fourth part, it would disaptate the principal element from being an ingredient in a mixture: The reason is, because there must be some parts adhering to such an element, whereby it may be received by the others: for example, had fire no ayr affixed to it (as I have formerly noted) it could not be received by water, but would be immediately expelled: Neither could the earth be disposed to receive fire and ayr, but by the admixture of some parts of water, some of ayr, and others of fire; but less then a fourth of these adherents would be insufficient. That this is really in effect thus, the separation of the elements is a testimony. Distil Sea-water, and redifie it often, but weigh it before distillation; the residue or fixed Salt, wherein fire, ayr and earth are contained, will in little less then a 6th. or 8th. (considering that the water, which is separated, is not so pure yet, but that it retaines some part of the peregrine elements, and that another part is dispersed through the ambient ayr) respond to the whole body of water. Or thus; Weigh Sea-water with distilled water, and the one shall be a sixth part heavier then the other; then imagine that the leasts which are evaporated of the peregrine elements are the remaining parts. Lastly, the elements being four in company, it is very consentaneous to their number that each should be separated by the others in a fourth.

The reason, why water constituting part of the fourth part of earth doth superate the ayr in one degree, is, because water is more agreeing, and that immediately, with earth then ayr, because of its weight.

2. Because it is nearer to the earth then the tract of ayr. Fire is least in proportion, because it is the remotest.

In the supplying the fourth of water, earth and ayr are in an equal proportion, because they are equally consentaneous to water; for earth is agreeable to it through its weight, and ayr through its continuity, and because they are also of the same propinquity to water. Fire is less in quantity then these through its remoteness: it is more then it is in earth, because it is nearer to it.

Ayr contains an equal part of fire and water, by reason they are

of

of an equal approximation, & of an equal concord with ayr, the fire agreeing to it in levity, water in continuity. Earth is in ayr in the same proportion, that fire is in water, because they are equidistant to each of their allied elements, and retain the same degree of Concord.

Fire hath the same proportion of earth, which earth in its proper Region hath of fire. It is sociated to more air in one degree then water, to more water in the same degree then ayr, to more water then earth in one degree also, because their several situation is nearer to fire in one degree.

III. Summarily through this Division the Firmament was established. The Firmament was the circumvallation of ayr and fire about the waters, which made the earth and water firm in their present situation, that is, bound them up together, and hindred them equally from all parts, from falling from the universal Center: for the ayr and fire being both light elements, do as well diffuse themselves from their own center towards the universal Center, as above it towards the imaginary *vacuum*: and so by this means come to sustain the mass of the weighty elements.

IV. Here a grand Objection, and no less Mystery offers it self, viz. that it is improbable, that the points of earth should be of an equal number and efficacy with the other elements, which by this section are so much expanded, that their magnitude is divisible into infinite points (as it were) in comparison to the points of earth, and which in respect to the *minima's* of ayr and fire are but as one point to a million or more.

To the answering of this, call to mind that the absolute form of earth is concentration through dense weight, and the form of ayr and fire diffusion from the Center; all these absolute forms are met and balanced (thence seem to be checked and obtused) by their reciprocal relative forms. Now the more these relative forms are degraded from their related form, the more they acquire of their absolute forms, and consequently greater and stronger motions. Well then, observe this great Mystery, and the hitherto yet unknown Labyrinth of the greatest Philosophers. The earth being degraded from her respective form, through that the fire and the other elements are abstracted from her, hath acquired the more of her absolute form, which is to fall to her Center: this then being her form, no wonder if she doth come to so small a quantity. The same apprehend also of water. So on the other side, fire and ayr being also as much advanced

ced from their relative to their absolute forms, do as much diffuse from the center, as the earth and water fall to their center: so that did not fire and ayr in diffusing from their center possess as great a place, as earth and water in moving to the center possess a little place, or the earth and water possess as little a place, as the fire and ayr a great place, it would be dissonant to their natures. Besides the little place taken up by the earth and water, is as much to them, as the great place taken up by the fire and ayr; their activity to the center is as much, as the activity of the others to the circumference. Were the earth imagined to be pure without the admixture of any of the other elements, its supposed place would yet be one fourth less, and likewise fire and ayr would in their supposed purity possess a place, yet one fourth larger: the reason is, because the fourth part of the admitted Elements to each pure Element, doth so much the more augment or diminish its quantity, which being pre-scinded, must necessarily either enlarge, or lessen their places. Wherefore you see, that it doth not hinder, but that the *minima's* of the earth and water may be equal in number & activity to the *minima's* of the others. Neither doth it hinder but that the earth and water being expanded by the support of the light elements (as appears in the *Chaos*) might have constituted so great a mole as the *Chaos* was, notwithstanding it appears so small now: for every natural point of water was almost half as much diducted (violently as it were) by the thin levity of the ayr, as such a proportion of ayr is now naturally through its absolute form expanded. So likewise was the air then half as much cohibited and incrassated through its relative form by the water, as the water is now incrassated. The like conceive of fire and earth.

Through these abstractions did all the temperate qualities of the *Chaos* cease, each element did arrive almost to its absolute nature. The greatest commerce, which they then exercised, was with each their nearest adjacent, as the fire with ayr, ayr with water and fire, water with earth and ayr, earth with water, and fire with ayr.

In this Scheme you may see the apparition of the second Division, which was the third act of Creation. The fire moves circularly, by reason of the ayr; the ayr is cast equally over the water; the water over the earth, both pursuing a circular course.

The Representation of the *Chaos*
after its second Division.



CHAP. XII.

Of the Third Division of the *Chaos*.

1. The effects of the Third Knock. *Why earth is heavier then water. Why water is more weighty near the top then towards the bottom. Why a man when he is drowned doth not go down to the bottom of the Ocean. Why a poich'd Egge doth commonly rest is self about the middle of the water in a Skillet. Why the middl: parts of Salt-water are more saltish then the upper parts.*
2. *Whence the earth hapned to be thrust out into great protuberancies. How the earth arrived to be disposed to germination of Plants. A vast Grove pressed into the earth.*
3. *The cause of the waters continual circular motion.*
4. *The cause of the rise of such a variety of Plants.*

I. **T**He third Division, or the fourth act of Creation, was whereby the most universal Nature (*naturans*) did yet more purifie, and as it were clarifie the Elements, in abstracting each element from its nearer, and congregating it to a proper place of its own. These several acts of purification and exaltation are not unlike to the operations of an Alchymist in purifying a Mineral:

1. He reduceth it to a powder, and mixeth it exactly; and so it was with the *Chaos*:

2. Then it is either put into a Retort, Alembick, or a Sublimatory, whereby the light parts are separated and abstracted from the heavy ones; this hapned also in the first Division.

3. He rectifieth the light parts in repeating the former operation and exalts it to a more sublime and pure nature, and so separates the lightest parts from the light ones; even so it was here, God did yet more separate the fire from the ayr. Touching the *caput motuum*, as the earthy parts, that he dissolves in water, and afterwards to purifie it, he coagulates the earth, and so separates it from the water; in the same manner did God here coagulate the earth, and parted it, from the waters. Further, how this is effected I shall in brief explain to you. The water through her gravity with crassitude, doth obtain a vertue in her of squeezing, which is performed by a body that

is weighty and continuous : for by its weight it presseth downwards to the center, and through its continuity it impedes the body, which it presseth, from entering into its own substance, and so forceth it to give way, which is the manner of squeezing. Now was this body weighty and contiguous only, then it would be incapable of squeezing, but would rather press another substance into its own Pores. Through this squeezing vertue is water rendred capable of collecting her own parts, by making Groves into the earth, especially being thereunto impelled by the divine Architect. But possibly you may object, that water cannot squeeze or press the earth, because the earth is weightier then it. I answer, that earth is weightier then water (*ceteris paribus*) supposing that neither is obstructed, or violently (as it were) detained : for instance, imagining that the mass of earth, and of water were each of them placed in Scales, no doubt but earth would be heavier, and its parts make a greater impulse to the Center, because they are single in every *minimum*, and not continued one to the other, and therefore one part doth not hinder the force of the other, but rather helpeth it : As for water, her impulse is lesser, because her parts are continued one to the other, and so are a mutual hinderance to one another : This I prove, take an hour-glass and fill it with water, never a drop shall pass through the center-hole ; the reason is evident, because although its parts are weighty, yet their continuity hinders them from stilling through, and so one part naturally cleaving to the other, doth preclude the way ; but sand you see easily passeth, because it being weighty and contiguous only, the one part giveth way to the other, and impels the same through. Wherefore, I conclude, that (all conditions being equal) earth is heavier then water. But the one being violently detained, may prove weightier then the other, and so water is detained by earth ; for water is impeded from concentrating through the protuberance of the mass of earth, which therefore causeth a more forcible innixe in water upon the superficial parts of the earth. I prove it, water weigheth heavier upon the top of high mountains then in the lowermost Region of the Ayr, because there it is remoter from its center.

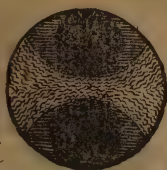
2. Water presseth more atop then underneath, because it is more remote from the center : this is apparent by mens experience in the water ; for if they suffer themselves to sink down, they feel the greatest force to press them from the supream parts of the water,

water, but the lower they descend to the bottom, the less force they perceive. Also there are many things, as an Egge dropt out of the shell into the water in a Skillet, and others, go no deeper then half way to the bottom; the reason is, because the superficial parts being most remote from the center, press more forcible then the parts under them. Men when they are drowned in the Sea, do not descend so low as to reach the ground, but so far only as the superficial parts of the Sea thrusteth them; besides there is reason for this, a mans body, although alive, must needs be less weighty then the thick water at the bottom of the Sea. I do not speak of the Seas depth near shoars; but where it is of an ordinary profundity, as in the Ocean. Dissolve Salt into water, the middle parts shall be more salrish then the superficial parts for the same reason. Besides these experiments, the understanding affords also an argument to demonstrate the same: If the natural propension of water be concentration, then the further it is remote from its center, the more it must incline to it; But the natural propension of water is concentration, *ergo* it is directed to its center.

II. Since then it is yielded that water is violently detained and remote from its center, no wonder if it doth squeeze the extime parts of the earth; whereby the earth giveth way in rotundity, and is protruded either into longitude or latitude. Water having formed but a small dent into the earth, a greater quantity of water must needs depresso thither, and so through a continued force, bores a greater cavern into the earth, until at last it hath perduced into her a vast grove, wherinto the body of water did retire, and so constituted the Ocean. The earth being thus impacted by the waters, must of a necessity be protruded above some part of the waters; and hereby was the earth disposed to germination of plants, she being now exposed to the celestial Influences, and moderately irrigated and fecundated by the remaines of the water.

III. The waters although congregated within this vast grove, yet they moved on still by the same pressure; because the grove was unequal, which hapned through the unequal pressure of the waters, falling more to one place then another: for where the waters beat in greater conflux, there certainly its force must be greater, and consequently dig a greater cavity, & the waters bending in a less conflux towards other places, their cavities must be more shallow. Now

had this cavity surrounded the earth equally thus, its motion would have ceased from that violence against the earth in boring into her substance, because its force would have been every where equal, and have procured a free passage: but the one place being shallow, & the other deep, the shallow did resist the pressure of the waters, through which resistance the waters did collect in greater quantity, and collecting in greater quantity, they must needs press against the shallow; for lower they could not press, because the earth was so much impacted there, that it could give no more way; *Ergo* towards the shallow, or must have rebounded into themselves; they could not rebound into themselves; for that would have proved their extream contrary motion. A shallow is removed by being pressed upwards towards the Continent, or by being equally laid and impacted to the earth at the bottom: so that by this means the waters are alwaies in a constant motion; for they meeting continually with shallows, and being resisted by them, do continually press against them, they being pressed down, they meet again with others, and so move round about the earth.



Or thus, water is heavier then the superficial parts of the earth, because of its detention: (as you have read before) through this weight it moves to its center, and heaps the earth aside; within these sides must be a hollowness, wherein the waters are collected; but since the waters have impacted the parts of the earth so close atop one another, that they can hardly give any more way, and since the waters are through their greater congregation rendred more forcible, they will not move reverberatorily into themselves, but being reflected and beaten back (as it were) by the impacted parts of the earth, do rather move towards the sides, because by these, each part of water is prevented from oppressing the other, and thereby one draweth the other after it, or, the one impelleth the other before it. Now since its detention causeth this strong motion, and that this motion cannot retort into it self, certainly, the next way must be towards the sides, in the same manner as the fire is demonstrated to move circularly towards the sides. Supposing the waters to have made a Channel about the earth, as we really see and know they have, it is impossible they should ever come to rest, because they are detained from concentration; *ergo* they must continually move circularly about the world; for one part must

The Representation of the *Chaos* after its third Division.



must necessarily draw the other, and one part preceding the other, must fall after it. This then is the undoubted and obvious cause of the Seas motion from East to West, and from West again to the East. In like manner the fire moveth also from East to West, and from West again to the East, that is round in a Circle. That this motion doth in no wise depend upon the motion of the Sun or Moon, I shall prove elsewhere.

IV. Through this division was the earth in part detected, whereby (as I said before) it was rendred capable of germination, or protruding plants. God did also congregate the earth, and separated her body from heterogeneous Elements, yet not so, but that there remained still some small part of them. These heterogeneous Elements (as I may call them for doctrines sake) were coagulated into small bodies, of divers figures. These bodies were of a different size and proportion, according to Gods intent and purpose, for to effect various and divers kinds of mixt bodies. The different proportion was, that in some there was a greater quantity of fire, in others of ayr, &c. The coagulation of these small bodies, was a close and near compaction of the elements within one small compass. Through this compaction each element was pinched in, (as it were) which caused the same violent detention of each (as you have read to be in water) necessarily augmenting the force and activity of each element; in fire it effected a heat, which is nothing else but a greater and condensed motion of the fire; (look below in the *Chapt. of 2^d Qualit.*) in ayr it agitated a thin swelling or bubbling, which proceeds from a coarctation of the ayr, whereby it is constituted in its motion towards the circumference by water moving to the center. Water again is incitated to a stronger motion through the detention of ayr swelling up against its compression. The earth is no less compelled to require her natural place, the Center, then she is opposed by the fire. Were all these violent motions (as it were) equal in their elements being formed also in one figure, they might continue so for ever, like as if they were all surprized by a Catroche: but being coagulated in an unequal proportion and unlike figure, they break through one another in some progress of time, and being confused in various figures, they effect also protrusions of no less variety in figures. Observe that in these commixtions the elements are confused in a contrary manner then they are placed without in their entire bodies. For here the fire against its nature (as it were) is constituted in the center, next the ayr, then earth, and wa-

ter is outmost. There the earth is the center, next to it is water, &c. Herein appears the wisdom and providence of *Nature*, which although casting the Elements into a fight, yet directs & terminates them into a most perfect friendship.

These coagulated bodies are called seeds, which are multiplied according to the number of the kinds thence budding. Seeds understand in a large sense, as they denominate the Rudiments and first beginnings of all mixt bodies. Otherwise Seeds are strictly attributed to living Creatures alone; as to Plants and Animals.

Although Herbs and Plants are alone nominated by *Moses* to be produced through this Division, yet the seeds of Minerals, and of their recrements (as they erroneously term them) and of Stones were also implied, since their Creation is no where else mentioned.

CHAP. XIII.

Of the Fourth, Fifth, Sixth, and Seventh Division of the *Chaos*.

1. *An Enarration of the Effects of the fourth Division. That Nature created the first bodies of every Species the greatest, is instanced in Bees, Fishes and Fowl. That all Species are derived from one individuum. That Adam was the greatest man that ever was since the Creation. What those Giants were, which the Poets feigned.*
2. *How the Sun and Moon were created. That a Lions is not more vigorous then a Lion.*
3. *How the Stars of the Firmament were created.*
4. *How the durable Clouds of the Ayre were created.*
5. *The Effects of the fifth Division.*
6. *The Effects of the sixth Division.*
7. *The Effects of the last Division.*

AS there was a coagulation of the waters and earth, so God did in the same manner through the fourth Division coagulate and further purifie the Elements of fire and ayre. This coagulation was of the heterogeneous Elements, namely of part of the adjoynd

16 parts

16 parts of the peregrine Elements. These being congregated, did condense and unite a great portion of fire, which condensation, through a mixture of ayr, water and earth, constituted it into a flame. Earth giveth a body to fire, and staies its light parts; ayr and water keep in the flame: Look below, where I have particularly illustrated the generation of a flame.

1. These coagulations consisted of parts differing variously in quantity; some greater, others less. Nature did also observe a most exact order among them: to wit, the first coagulated one greatest body, afterwards some greater bodies, lastly, many little ones. I prove this, In all kinds there is one greatest; because there is the least; for where there is a least, there must necessarily be a greatest. Among Bees there is one, which is the greatest; and therefore he is the Leader and King of all the rest: Among Fowl, we see the same, namely that there is one greatest in each kind of them, which all the rest follow and fly about. In a multitude of Fishes, they all swim after and about one, which is the greatest among them, &c

2. The greatest of all kinds were created at the beginning of the world, because that being the Superlative degree, and therefore excelling the others, must have been created immediately by God, he creating immediately nothing, but what is the most excellent.

Since that all beings have their rise and origine from one, it is necessary, that this one should be the greatest. That all beings derive their rise and original from one, is evident, in that all beings arised from the *Chaos*.

2. In their several kinds; as in man, all men took their Original from one first man *Adam*. God proposes among the perfectest living creatures a pattern of all the rest, which is man: Now, he being multiplied through one, although not from one man, it is not improbable that all other *Species* of living creatures multiplied through one.

3. We read in the first Chap. That God did first create the moving Creatures, that is one of every kind; for otherwise *Moses* would have written that God immediately and primarily had created two of every kind. In v. 20. *Let the waters bring forth abundantly the moving creatures; and fowles.*

In v. 21. He plainly expresseth that God created every living creature that moveth, that is, one of every kind, as I said before.

And in the 24th. *Let the earth bring forth the living creature after his kind*, not living creatures after their kind. And in the 29 v. *Every Herb bearing Seed*; not Herbs: So that this is not to be doubted of. You may object, that in the 24th. v. It is said, that *God created great Whales*; ergo more then one. I deny the Consequence; for *Whales* here denotes the plurality of *Species* of great Fishes, to wit, *Porpoises, Dolphins, Whales*, strictly so named, &c. not the plurality of *Individua* in every kind.

4. Nature is uniform, and not various in acting, ergo since she created the first man single, and out of him a woman, it is apparent, that she observed the same order and manner of creating every other perfect moving creature.

You may object, that according to the Antecedence, which I offer as a Maxime, man should be created in the same manner as Beasts.

I Answer, If you consider him only as a moving Creature, having a sensitive soul, he was; but if as he is man, that is, *Mens, scilicet Substantia spiritualis & rationalis in corpus hominis vivens & sensitivum a Natura infusa*; a Mind, or a spiritual rational substance infused by God into a living and moving body: then no doubt but the action is various, since it is in *diversa actionis Specie*.

5. God acteth by the fewest Meanes; but one is fewer or less then more; ergo.

If then all beings are multiplied through one, then this one must necessarily be the greatest. I prove the Consequence. You are to apprehend, that man as he is an Animal is propagated in the same manner as other Animals. Being then propagated through one, that one must have been indued with the greatest and strongest virtue of propagation, because that waiting and weakning in progress of time could not be sufficient to last out a whole race: this greatest virtue must be affixed to a proportionate subject or body, which must then be the greatest body; for the greatest virtue cannot be contained in a less subject then the greatest body: this is evident in a great flame, which must be maintained in a great place.

2. We may remember out of History, that the nearer men lived to the first man, the greater and stronger bodies they had; the longer they lived; the more numerous issue they had; and the more generous, and the less exercised in wickedness, all which proceeded from a stronger virtue and a greater body. If so, then

it.

it is not improbable, that the first man, and all the first of other kinds of Animals were the greatest; for the same reason. Besides we read in *Joshua* 14. 15. That *Arba* (in some Bibles written *Adam*) was the greatest among the *Anakims*. Which most Interpreters judge to be spoken of the first man *Adam*.

But possibly you may reply, that if *Adam* was the greatest man, he must have been thought to be a Giant, but a Giant is monstrous: wherefore *Adam* was not the greatest man. I deny the *Minor*; for monstrous is that, which doth degenerate from the *Species*, so that it makes a difference between that which is adjudged to be a Monster, and the *Species*; as the abundance or defect of parts, or a deformation in some or all parts, through which its Subject is rendered different from the *Species*, to which it was intended; but a great, greater, or greatest man is no more a Monster than a little, less, or least man; because there is no difference between either in number, form or figure of parts. 'Tis true, Giants have been generally received for Monsters, but then they were differing from other men, in number and figure of parts; as the *Cyclopes*, a great sort of people, feigned by the Poets to have had but one eye in the midst of their Forehead, and to be *Vulcans* Journeymen, employed in making weapons for *Jupiter*. Grandeur of body, if actuated by sufficiency of vigorous spirits, is a perfection denoting strength of all the animal and vegetative faculties, fitted for long life, and propagation, which therefore must not be detracted from the first of all kinds.

II. Hence I may then safely infer, that in the Firmament the greatest part of the heterogeneous elements, and a great proportion of fire were conglutinated into the greatest flame, which was the *Sun*. Out of the courser part of the *Sun*, God created another great body, next to the greatest the greatest, which was the *Moon*. For as Earth, Waters, and Animals were defecated by having other bodies formed out of their courser matter, so it was also in the Element of fire. This is most obvious in Animals, whose Female was formed out of the courser part of the Male, whereby it becometh more excellent and vigorous in all its actions. This may be contradicted, in that a Lioness is taken to be more vigorous and fierce than a Lion. I Answer, that this kind of fierceness and apparent vigour is in all Females, but it is not lasting, more a spurt and shew of vigour and fierceness, than real and durable.

III. These

III. These two great flames did by their hourly motion produce other great ones, which again propagated (as it were) lesser, and thence little ones, which were those, by us now called Stars. But of these more particularly hereafter.

IV. In the Ayr the like coagulation formed the thin Clouds consisting of a great part of Ayr, incrassated through a smaller quantity of water, and punctually divided by the same proportion of fire, balanced and incorporated with the least measure of earth. These Cloudes have their continual abode in the ayr, seldom vanishing. Their Colour is blewish, arising from its incrassation through water, and incorporation with earth: for the ayr of it self is so thin, that it is insufficient to unite a light, or cause reflection, but being reduced to a thicker consistence by the co-expansion of water with it, it becomes capable of uniting, reflecting and propagating a light; now were there no Particle of earth affixt to this mixture, the colour would be transparent, lucid, or ChrySTALLINE, But being somewhat obtenebrated through the density of earth, is changed into a light blew, or light Sky-colour.

V. Thus did the great Artess *Nature* make her process in the elaboration, purification and exaltation of the Elements; neither was she yet arrived to her ultimate intention or end, but proceeded in her scope by a more arct and pure coagulation of parts in dividing the heterogeneous parts yet more from the body of water, and so knitting them together again. This was the fifth Division, whereby God divided the purest and subtilest part of the Elements before divided and coagulated from the course and impure parts, and promoted them to an arcter coagulation; this was, as it were, a fourth rectification of the Elements. In the water the coagulated bodies through the vivification of the Planetary influences, became Fishes: In the Ayr Fowl.

VI. The Sixth Division respected the Earth, out of whose more purified and rectified parts protruded to her superficial Region, Cat-tel and Beasts were animated by the same Influences.

Lastly, By vertue of the Seventh Division Man was created, and formed out of the most exalted Quintessence of the purest coagulation of Earth, animated through the Benigne vivifying Beams of the Sun, after which a (*Mens, five Spiritus, five Lux Rationalis*) a Mind, or a rational spirit, or Light was inspired or infused from God into this most sublime Tabernacle.

How

The Representation of the *Chaos* after its latter Divisions.



A. Hertochs. sc.

How a Creature is vivified and animated, I shall demonstrate in its proper place.

Man again was further purified and defacred by having a woman created out of his grosser and less digested Parts.

CHAP. XIV.

Of the Second and Third *Absolute Qualities* of the Elements.

1. *What is understood by Second Qualities.*
2. *What the Second quality of Earth is.*
3. *Aristotle's Definition of Density rejected.*
4. *The Opinions of Philosophers touching the Nature of Density.*
5. *The forementioned Opinions confuted.*
6. *The Description of Indivisibles according to Democritus disproved. That all Figures are divisible excepting a Circular Minimum. That Strength united proveth strongest in a round Figure: and why.*
7. *What the Second Quality of Fire is. Cardan, Averrhoes, Zimara, Aristotle, Tolet, and Zabarel their Opinions touching the Nature of Rarity confuted.*
8. *The Second Quality of Water. Aristotle, Joh. Grammat. Tolet, Zabarel and Barthol. their sense of Thickness and Thinness disproved.*
9. *What the Second Quality of Air is.*
10. *What is intended by third, fourth or fifth Qualities. An Enumeration of the said Qualities. What Obtruseness, Acuteness, Asperity, Levor, Hardness, Rigidity, Softness, Solidity, Liquidity and Lensor are, and their kinds.*

THE Second Qualities are those, which do immediately descend, or emanate from the first without any nearer interposing. Their Number is adequated to the Number of the first qualities, and therefore are only four: because an immediate and univocal cause cannot produce more immediate and univocal Effects than one.

Second qualities proceed from the Elements either $\kappa\alpha\theta' \alpha\upsilon\tau\eta$, or $\kappa\alpha\tauὰ \sigma\upsilon\mu\beta\epsilon\beta\eta\kappa\iota\varsigma$. Second qualities $\kappa\alpha\theta' \alpha\upsilon\tau\eta$, or *per se*, are such as emanate primarily from the absolute forms of the Elements.

Second qualities $\kappa\alpha\tauὰ \sigma\upsilon\mu\beta\epsilon\beta\eta\kappa\iota\varsigma$, or *per accidens*, emanate primarily from the respective forms of the Elements.

In the Precedent Chapters hath been indistinctly treated of the first and second qualities united into one, as really they are, but they are two, and distinct from each other *ratione*, because we conceive them distinctly, and apprehend one to be the cause of the other. The reason why I did then propose the first and second qualities as one form of the Elements, is, because there I handled them as they were really inherent in their Subjects. Here my purpose is to describe them as they are successively apprehended by us one after the other.

II. The first quality, power, or *uopon* of the earth is *gravity* with *contiguity*: the second or next quality emanating nearest thence is *density*; for conceiving a thing to be weighty and contiguous in its parts, that, which we apprehend next, is *density*; for if a thing is weighty, or pressing to the Center, and its parts contiguous, it cannot but be pressed very close, since its parts are contiguous whereby they give and make way to and for one another; which closeness of parts emanating from a contiguous weight is called *density*.

III. *Aristotle* describes *Density* to be that, whereby a substance contains much matter in small dimensions. I cannot well guess what he calls much matter; whether he means much matter only without the intention of its form, or much matter with much of its form. The first is not possible; for whenever matter is augmented, its form is alwaies intended with it; and likewise the diminution of matter attendeth the remission of its form, which is evident in fire; cast more fewel to it, and its first quality will also be intended. If he implies the last, where then consists the difference between *Density* and *Rarity*? For dense bodies contain no more matter than rare ones; for each their matter is adequately extended to the extension of their form. Doth a Lump of earth contain more matter than a tract of ayr of the same proportion? No certainly, for there is as much matter in that proportion of ayr, as there is in the same of earth. Matter is that, whereout a thing is made; but there is as much of that, whereout the ayr is made, in the ayr in the

same extent of place, as there is in earth, whereout that is made. But answer me, whereby will you know, what hath much matter in a little place or dimension, and what hath little matter in a great place? You will say, by its weight: So that whatever is weighty, that containes more matter then that which is light. Why shall a body be said to have more matter from its gravity, then another from its Levity? Or why shall a light body have but little matter, and a weighty one much? If a weighty body hath more matter, because it is weighty; then it is more a body then a light body, but that is absurd. By more matter, I mean *magis materia*. But you answer your meaning to be *major materia*; neither that; for as I said before, the least particle of ayr hath as much, whereout it is made, as the least particle of earth: It is true, it hath not so much weight; for it hath none, but weight is not the matter of a thing, but its form; how then can a weighty thing be said to have much matter, because of its weight? Wherefore let me tell you, that density doth not derive from the matter of a thing, but from its form, and that it is not the *Modus solius materiae*, but *formae*.

The same may be urged against the *Paripatetic* Definition of *Rarity*, which is, whereby a body containeth little matter under great dimensions. The matter, which is to be contained under great or little dimensions, must be of that quantity as to fill its place, which rare and dense bodies do equally under the same proportion. But doubtless these Definitions cannot be defended, unless they be likewise free to defend a penetration of bodies.

IV. We find a very dense contest among Philosophers about the manner of condensation and rarefaction.

1. *Scotus* in 4. *Distinct* 22. *Quest.* 4. opiniates, that there are new parts of quantity produced in rarefaction, and other old ones corrupted.

2. *Marsilius* in his *Metaph.* *Quest.* 9. *Art.* 2. asserteth, that in rarefaction and condensation the whole or entire old quantity is corrupted.

3. Others to save their Doctrine of Condensation and Rarefaction, are constrained to affirm a penetration of quantity, which they say, may naturally happen, provided it be not of all, but of some parts only.

4. *Hurtado*, *Phys. Disput.* 15. *Sect.* 5. *Subject.* 4. laies down a Principle invented by his Master, which according to his Judgment

proveh

proverb an Expedient to expound the nature of *Rarity* and *Density*. There are (saith he) certain indivisibles contained in bodies, through the inflation or puffing up of which, bodies do acquire a greater or less place. But to avoid all inconveniences, they allow these indivisible points not to be formally only, but virtually also divisible and extensible according to place and force impelled upon them. To this Opinion doth *Arriaga* also subscribe, *Disp.* 16. *Sect.* 9.

5. The Jesuits of *Conimbrica*, Lib. I. Cap. 5. q. 17. Art. 1. state, that *Rarity* and *Density* are consistent in a certain quality, inherent in quantity, through which that quantity is contracted or extended to a greater or less space. In fine, after a long sweat, they are forced to confess ingenuously with *Hurtado*, that this difficulty is not to be cleared.

V. The subtil Doctor runs far beyond his Byas in admitting a natural corruption in parts, and that happening almost every moment; wherefore he is rejected by all in this particular.

What the Assertors of the third Opinion have stiffely affirmed in their whole Philosophy, that they are now reduced to deny, and exposed to a probation of a penetration of quantity: which if a quantity is consistant of potential parts only, and indivisible into indivisibilities, then no question, but it will go for them; for then it remains indisputable, that in a Line the points do all penetrate one another, and consequently must consist out of infinite potential parts.

Hurtado and *Arriaga* do now yield to actual formal indivisibles, but yet virtually divisible: How an indivisible can be inflated, they do omit the illustration. This is most certain, that contiguous indivisibles are inextensible, and therefore may not be inflated.

2. This Inflation is violent, but there are many bodies naturally dense, as the earth, and therefore inflation being violent, is not a means tending to addensation. Besides, they pass by to express their meaning of Indivisibles, whether such as *Zeno* and *Democritus* teach-ed, or others.

VI. If they side with *Democritus*, they fall into a greater Errour; for his Indivisibles were, 1. Infinite. 2. Fluctuating in a void place. 3. Of various Figures.

All three most notorious contradictions: For can a thing be in-

finite, and yet be terminated with Figures; a plain Contradiction.

2. Can finite bodies be produced out of infinite material Causes? If material causes are infinite, the body constituted by them must also be infinite. Wherefore another Contradiction.

3. There is no real *vacuum*, but an imaginary one.

4. Can a thing be indivisible, and yet be under various figures? There is no figure indivisible, but a round *Minimum*; because all its parts are fallen equally so close to the Center, that they escape a real division thereby, although not a mental one; but other figures, as Triangles, must of necessity be divisible; because all figures are made out of a Circle or Rotundity, for take away the Angles of a Triangle, Quadrangle, &c. and there remains a Circle. The reason why a round *Minimum* escapes division is, because there is nothing sticking out, whereupon an extrinick Agent can take hold, because its extreame imaginary parts are strongest in being equally united to the Center; and therefore one imaginary part is so strengthened by the other, & fastened to the other, that any real division is impossible upon them; but a triangular, or any other angular figure is divisible, because its real parts are unequally allied to the Center, whence there ariseth a strong opposition in one respect, and yet a small resistance in another; for the angles do receive the force of an extrinick Agent, but a round *minimum* shoves it off, and so makes but little resistance, and yet a great opposition; we see that a small round Bullet shall pass where a great angular body shall not, although impelled with the same force, and do consist of the same matter: the reason is, because in a round figure there is less resistance, and the opposition is the greater, because of the union of parts. I have oft thought upon the intencion of that ordinary Saying, *Vis unita est fortior*: Strength united is made stronger. This holds good only in a round figure; for therein force is most united; for all its parts are equally allied to the Center, and every part helpeth the other, and makes no resistance, but great opposition. This appears in your round short-arm Fellowes, who shall carry a greater burden, then the biggest and tallest men. I do remember that I have seen at a Sea-Village called *Scheveling* in the *Low-Countries*, a dozen men or fewer, remove and carry a Pink of no very small burden, upon their backs from the shore into the Sea. Their strength was

very

very disproportionable to move so great a body, but the placing of themselves in a round Figure, did soon square their force to the Bulk. Three of them were placed before at one side of the bowes, three on the other side, three more on each side of the Ship, and so those twelve moved with their backs one against the other circularly, not thrusting the Ship forward or from them, for then they could not have done it; but every man moved circularly to the Center, and against the force of his Diametrical opposite, and so lifted the fore parts of the Ship up upon their backs, which being a little raised from the ground, fell or moved forward through her own declining weight. Touching the men themselves, each of them put himself into a circular posture, applying his back against the Ship, resting his hands and arms upon his Knee, and inclining his Head and Neck towards his Breast. But this by the way.

The *Conimbricenses* endeavour to help the matter by shifting it off to a quality inherent in quantity. Indeed I had alwaies apprehended a quality according to the *Peripateticks*, to have inhered in a substance, and not in quantity; for it is absurd to assert in their Philosophy, that one Accident inheres in the other. Nevertheless they intend *Matter* by *Quantity*; wherefore by the way you may observe, that *volentes volentes*, they cannot apprehend any thing by *Matter* but *quantity*, as I have proved before. Further, to patch the cause of *Density* upon *Quality*, is a blind shifting; for *Quality* is so remote a name, and there are so many qualities, that unless they indigitate to a particular sensible quality, they effect little.

Their vain Groapings, Guesings and Ignorances depend upon the Cloud, which they leave upon the nature of *Density* and *Rarity*; for did they but study the true Definition of either, it would not a little contribute to their Information.

In the first place, They imagine *Density* to be a violent quality, whereas you see it is natural.

2. They make no distinction between *Density* & *Thicknes*; for *Thicknes* doth in the same sense (although improperly) contain much matter in little Dimensions, & notwithstanding they are different: & so doth *Thinness* contain little matter under great Dimensions, as improperly as *Rarity*; Wherein is *Rarity* then distinct from *Thinness*? nevertheless do Authors affirm that many thin bodies are dense. The same is attested by *Cardan*. How then can the above-given Definition stand good? A thing shall then contain at once much matter

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in small dimensions, and little matter in great dimensions, *ergo* a thing is thin and thick, rare, and dense at once.

No question it is also an erroneous Assertion, that some thin bodies are essentially dense, or that any thick bodies are essentially rare; neither is *Tenuity* or *Crassitude* the cause of *Density* (as *Scaliger* doth well infer in his 283 *Exerc.*) but a *contiguous Gravity*.

VII. The first power or Form of Fire is *Levity* with *Contiguity*. The Second next flowing thence is *Rarity*, which is an expansion or diduction of a body that is light with *Contiguity*. This followeth *Levity* with *Contiguity*, because a thing which is contiguously light cannot but be diducted. *Scaliger* doth justly except against *Cardan* in *Exerc.* 4. You say that the reason or manner of a rare and dense body is taken from the multitude or paucity of matter. Moreover it is not the multitude, or paucity of Matter makes *Density* or *Rarity*, neither doth *Density* cause the multitude of matter, or *Rarity* the paucity of it. The Demonstration is the same for both; because the same body may be rarified or condensed without the encrease or decrease of Matter.

Averrhoes, *Lib.* 4. *Phys. Comment.* 84. doth hesitate very much in this Particular, as appears by his contradictory affirmations; for in that place he asserts, that *Rarity* and *Density* are contraries in quantity: Again in the next following Comment. he saith, that *Rarity* and *Density* are not of the essence of quantity. In *Lib.* 7. *Phys. Com.* 15. he affirms, *Rarity* and *Density* to be qualities: but in *Lib.* 1. *Metaph. Com.* 15. he refers them to the Predicament of *Situs*: and *Lib.* 8. *Phys. Com.* 77. he saith, that *Rarefaction* and *Condensation* are Local Motions.

Zimara doth labour to draw all these various Dictates of *Averrhoes* to a good sense. When he seemed to place them in the Category of *Situs* (saith he) his intention was only to relate the Opinion of other men. In saying that *Rarefaction* and *Condensation* were in the Predicament of quantity, he meant that quantity did consecret them, but not formally; for a greater quantity doth follow *Rarity*, and thence the possession of a greater place: wherefore *Rarefaction* is primarily and essentially an alteration, and a motion to quality, but secondarily and by consequence it is to a greater quantity, and a larger place.

Toler. *Lib.* 4. *Phys. Cap.* 9. *Text* 84. tells us the Opinion of *Aristotle* upon this intricate Point. He expounds his Judgment upon *Rarefaction*,

Rarefaction, which (in short) implies, *Rarity* and *Density* to be two contrary *qualities*, educed out of the power of matter, as others also are; for when a thing is condensed or rarified, that doth not happen properly, because something is expelled, or something doth enter, or because the parts are conjoynd among themselves, or are separated by reason of a (*vacuum*) voidness; but because such a *quality*, *Rarity*, or *Density* is educed out of the power of matter, so as that its Subject should be changed; as when it is made hot or cold: for the Ancients said, that no part of a thing was changed in *Rarefaction* or *Addensation*, but that its parts came only somewhat nearer, or were removed from between themselves. However *Aristotles* Dictates contain nothing of this: but when a thing is rarefied or condensed, the whole and the parts too are changed by an accidental mutation, in receiving a *quality* educed out of the power of matter; which is appatent, because in a rare body every part is rare; which if *Rarity* hapned only through the separation of parts among themselves, the parts doubtless would remain dense, which is false, as appears in things that are rare, and most in the Elements.

A great deal ado about nothing. That which through it self is most obvious, they involve into obscureness through their Cavils. Whether *Averroes* intended his words in that meaning, as *Zimara* comments, or not, (which is more probable, because he doth not give the least hint of an indirect sense of his words, and therefore they are to be understood in their direct intention: As for *Zimara* his reconciliation, that alledging no reason, and since the same might be guessed of his words, although he had purposed them for a contrary signification, it doth not merit any acceptance) is not material, either promising no truth or evidence.

Tolet. rejects the Judgment of the Ancients upon this Particular, but hath not the ingenuity to add Reasons, to confute them, only from an inbred School-bending to *Aristotle*, faith as he is told. He declares then with the Philosopher, that in *Rarefaction* and *Addensation* the whole and parts are changed by an accidental mutation in receiving a *quality* educed out of matter, because in a rare body every part is rare.

In the first place, his Reason is weak; for in a rare body every part is not rare, as appears in the ayr, which they term to be rare; wherein many dense parts, as black Clouds, are contained, neverthe-

less

less the whole Body is called *Ayr a majori*.

2. Supposing that every part of the whole is rare, he infers nothing, but that every part, or the whole is rare, which is *idem per idem*.

2. If *Rarity* (saith he) were caused through separation of parts among themselves, the parts would remain *dense*. It seems by *Rarity* and *Density* he apprehends nothing else but the diminution or augmentation of *quantity*; for in the same *Comment*, he writes thus, *You must note that to be made little out of great is to be condensed, and out of little great to be rarified*. Here he contradicts himself; before he stated them *qualities*, now they are changed into *quantities*. But to his Reason. 'Tis true (as he saith) if *Rarity* were caused through separation of parts in a mean body among themselves, the parts would remain *dense*, supposing that the light parts were separated from it. But supposing the dense parts of a mean (that is equally consistent of dense and rare parts) body, the remaining parts would be rare.

2. A dense body is not rarefied through any separation of its parts, or inflation of its *minima's*, but by the adjoyning of light and rare parts to it.

I wonder what accidental change it is he means; it must be either to *quantity*, and then it is the same with *augmentation* and *diminution*; or to *quality*, and then it is an *alteration*, or a locomotive *quality*: but he mentions none. Supposing it to be a *quality*, the question is, whether this doth arise in that subject with the adherence to its primitive matter of the extrinseck *Agent*, or whether it doth migrate out of its own subject into another. It is not the latter; for I have proved in my *Dispute of Powers*, that an *Accident* doth not migrate out of one Subject into another. If the first, then it is by the entering of another body between the parts that are separated, and what body is that but fire? It is that, which through its contiguous lightness, doth render a dense body rare, and so condensation is by expelling the light parts, or admitting more parts of a dense body, as of earth, which doth condensate through its contiguous gravity. Wherefore we are not forced to grant a *VACUUM* in *Rarefaction*, because a body is rarefied through the supplying of the supposed void spaces by the presence of fire. Neither need we to assert a penetration of bodies in *Condensation*, since that those parts, which are supposed to be penetrated into the substance of others,

are expelled. It is not then, as *Tolet* writes, that rarefaction is become great out of little without the apposition or detraction of a new Substance; for were it so, then of a necessity there must be allowed a penetration of bodies in condensation, and a *vacuum* in Rarefaction: wherefore *Scaliger* saith well in his 4th. *Exerc.* That there can be no addensation or rarefaction (although *Rarity* and *Density* are really in them) in any single body. *Ergo dum inter unum minimum naturale ignis puri, & minima continua circumfusa nullum medium corpus intercedat, quoniam igitur modo queunt esse propius aut longinquius sine intervallo, mutuae corporum penetratione?* Wherefore since between one natural *minimum* of pure fire, & the surrounding continued *minima's* (which are the *minima's* of the ayr) there is no middle body interposed, how then can they be nearer or further without an interval or mutual penetration of bodies? The reason (as I said before) is, because without the adjunction of another body to a single one, there is no rarefaction or condensation.

Observe by the way, that many of the *Parapeticks* make a two-fold *rarity* in bodies. The one they confound with a thinness, as you may read in *Arist. Lib. 2. de part. Anim. Cap. 1.* And *Grammat. Lib. 2. de ortu & inter. Context. 8.* This they refer to the *Category* of *Quality*, and doth consecute heat. The other, which is the more frequent and proper acception of *Rarity* (as they say) is, which doth not consist in a *Tenuity* of a substance, but in the distance of parts between one another, and so they call a sponge rare, because it hath parts distant from one another through an interposed space, not really void, which contains no body, but is filled with another thin and insensible body; as in a Sponge, whose parts are called void, wherein notwithstanding ayr is contained. This kind of *Rarity* they refer to the *Category* of *Size*. I take them in this last Acception, and demand, whether it is not the ayr, which causes that situation and distance of parts? For the Sponge is condensed, through expressing the ayr by compression of the Sponge: If so, then it is not a single quality educed out of the power of matter, but the entering of the ayr into its pores, which doth rarifie (as they term it) the Sponge.

Zabarel, Lib. de Calore Cœlest. Cap. 3. attributes *Rarity* to the causality of heat, and density to Coldness. But before he had proposed an Objection, which was, that heat is produced by rarefaction and attrition: To this he strives to answer below, but finding

he could not go through with it, recants, and states, That in the Elements, as they are simple, their heat doth produce *Rarity*, and so doth *Rarity* reciprocally produce heat. An absurdity, to affirm the effect to be the cause of its cause, and the cause to be the effect of it self.

2. Heat is not the cause of *Rarity*, because fire is the rarest of all in its own Region, and yet, as they confess, fire is not hot in its own Seat.

VIII. The first quality of water is *gravity* with *continuity*: the second emanating thence is *Craffitude*, which is a thick consistence, exporrected through all its dimensions. You will grant me, that *Craffitude* proceeds from an arēt and near union of parts, or from a close compression of the said parts. This compression and union derives from gravity; this gravity being continuous, doth necessarily cause a *craffitude*; for were it contiguous, it would effect a *density*. There is nothing, unless it be water, or waterish bodies, that is thick, as Oyles, Gums, Rozzens, fat, Tallow, are all waterish so far as they are thick; yet not without the admission of most Ayr; Ice, Chrystal, Diamonds, and most Precious stones are waterish, and therefore thick. Choler, Pepper, the Stars, &c. are rare, because they are fiery, that is, participate more of fire, then of any other Element. Flies, Cobwebs, Clouds, &c. are thin, because they are airy. All earthy bodies are dense; as Minerals, Stones, &c. Now as it is necessary, that all the Elements should meet in every body, so it is necessary, that there should concommitate *Rarity*, *Density*, *Tenuity* and *Craffitude* in each mixt body. Wherefore do not think it strange that *thinness* and *thickness* should be in one body, although they are counted contraries among Authors.

I cannot but admire that all Philosophers to this very day should have confounded the signification of these words, *thick*, *dense*, *thin*, *rare*, naming thick bodies dense, thin ones rare, and so reciprocally, as if they were one, whereas there is a great distinction between them.

Aristotle, *Johan. Grammat. Tolet*, *Zabarel*, and many others take *thinness* and *rarity* to be the same, as also *thickness* and *density*; whereas you may now evidently know, that they are altogether distinct, and wherein they are so. It is erroneous to say, that water is dense, or fire thick, ayr rare, &c. but water is alone thick, ayr thin, earth dense, and fire rare;

Bartholin.

Bartholin. Lib. 1. Phys. Cap. 5. defines *Thicknes* by an adulterine cause: *Thicknes* (saith he) is thought to derive from *coldnes* and *density*. And a little before he described *Density* to be derived from *coldnes* and *thicknes*. Mark his thick dulness in asserting *thicknes* to be the cause of *density*, and *density* of *thicknes*. The cause must be prior *causato naturâ saltem*, but here neither is prior. He makes a difference in their names, but *in re* he concludes them to be one.

IX. The first quality of *Ayr* is *Levity* with *Continuity*; its second is *Tenuity*, which is a thin consistence of a substance; wherefore *thinnes* and *thicknes* are (as it were) *modi consistentia*. Heat is not the cause of *tenuity* in *ayr*, because heat is accidental to *Ayr*, and *tenuity* is essential, or at least co-essential; but that, which is accidental and extrinseck, cannot be the cause of that, which is essential and intrinseck. The next effect we can imagine to emanate from *lightnes* with *continuity*, or the greatest diduction, and yet remaining continued, must needs be *Tenuity*.

Besides these, there are some more qualities restant; as *Obtuseness* and *Acuteness*, *Asperity* and *Levor*, *Solidity* and *Liquidity*, *Softness* and *Hardness*, *Lentor* and *Frivility*.

It is a mistake in Authors to derive the Original of these *Qualities* from the Elements, as they constitute a mixt body, and thence to term them *Qualities* of a mixt body. To the contrary, they do emanate from the Elements as they are conceived in their absolute form, as hath been proved.

These *Qualities* you may nominate third, fourth, and fifth, according as the understanding doth apprehend the one to be before the other in *Nature*, although not in *Time*.

The third qualities of the Elements are *Obtuseness*, *Acuteness*, &c. I prove it: because we apprehend them next to the second qualities; for the understanding, in discerning these sensible qualities, is lead by the Senses as its Pilots; now our tact or feeling being the first in *esse & operari*, is also employed in distinguishing those first, second and third *Qualities*: and for that reason they are all called *tactible* or *tangible* qualities. The first action made by any of the Elements upon the tact is local motion, as *Gravity* and *Levity*: for feeling any Element, its *weight* or *lightness* would be the first thing we should perceive: the next would be its *rarity* or *density*. The

third, *acuteness* or *hebetude*: the fourth, *asperity* or *levor*, the fifth, *hardness* or *softness*; the sixth, *solidity* or *liquidity*; the seventh, *lenor* or *friability*.

There is a twofold *Acuteness* formally differing from one another:

1. An *Acuteness* deriving from *Density*.

2. An *Acuteness* emanating from *Rarity*.

Acuteness is a quality whereby our tact is most divided.

Obtuseness is a quality whereby our tact is least divided.

Acuteness is in Fire and Earth, but in a different manner.

Acuteness in fire is a *rare acuteness*, whereby it most divideth our tact, through its parts being contiguously diducted, or spread from the Center.

The *acuteness* inherent in earth is a *dense acuteness*, whereby it divides our tact through a dense *acuteness*, or *minima's* moving through their pressing weight to the Center.

Obtuseness is a quality following crassitude and tenuity, whereby its subject compresseth our tact: or divideth it less or least and in longer time.

Obtuseness in ayr is a quality immediately produced by its tenuity and continuous Expansion; for were it contiguous, it would be acute, but being continuous, one part hindreth the other from penetrating or dividing any objected body; And so its parts acting together and equally, they effect a compression. This compression or obtuseness in the ayr is thin and subtil, and more potent then that in water, because it resisteth less, and therefore is also less opposed, and through its subtility is capable of making stronger opposition.

Obtuseness in water issueth out of a thick quality, or from its continuous depressing vertue. This *Obtuseness*, and that in ayr, as also *acuteness* in fire and earth, are altogether different (as I said before) but through the narrowness of the Language, I am compelled to attribute each to two several beings, adding some notes of Distinction. The same understand of all the other derived Qualities.

Asperity is a quality immediately consecuting *Acuteness*; and *Levor* is a quality emanating from *Hebetude* or *Obtuseness*. *Asperity* (more plainly) is an inequality or roughness in the surface of a body; this, experience tells us, proceedeth from a sharpness or *Acuteness*.

Acuteness. *Levor* is an equality of the Surface descending from *Hebetude*, or a continuous pressure or diduction.

Asperity in fire is a rare, diffusing and vibrating asperity: that in earth is a *dense, heavy contracting asperity*. I prove it, our feeling certifieth us that fire is a rare, diffusing and vibrating roughness; and so feeling earth, we feel a dense, heavy and contracting roughness.

From a contiguous and dense *Asperity* spreads *hardness*: which is a quality, whereby its subject is difficultly pressed down into it self. So *thin Levor* begetteth softness, which is a quality, whereby its subject easily giveth way into it self to pressure. Hardness in earth may properly be termed *Rigidity*, or a rugged hardness, because the earth doth only of all the Elements possess its center, and therefore cannot introcede into it self.

That *Rigidity* is caused by *Asperity*, its ordinary Definition among Physicians doth testifie: *Rigidity* (say they) is a hardness with *Asperity*, or a roughness, that is from asperity.

From a continuous and thick *Obtuseness* derives a *smooth hardness*, such as is conceived in Chrystal or Ice, and is alone proper to water.

Softness in fire being unequal or rough, is, whereby it giveth way towards its Circumference, if pressed from without.

Softness in ayr being equal and smooth, is, whereby it giveth way towards its Circumference, if pressed from without.

Solidity is an effect of hardness, through which a body is consistent, that is, incapable of flowing: So water is a smooth solid body, because of its peculiar hardness: and earth is a rugged solid body, likewise because of its proper hardness.

Liquidity is an effect of Softness, whereby a body is apt to flow, or to be diducted. In Fire it is rare and acute; in Ayr thin and obtuse.

Solidity produceth *Friability*, which is a quality, whereby its parts are separable from one another in minute particles; wherefore since *Solidity* cannot give way by flowing, it giveth way through *Friability*.

Lentor is a quality produced by *Liquidity*, and is, whereby a body is rendered deductible by reason of its continuity of Parts.

We

We may otherwise apprehend these qualities to differ from one another *secundum magis & minus* thus; *Asperity* is a greater Acuteness of parts: *Hardness* is a greater Asperity, or thick *Levor*: *Solidity* is a greater Hardness: *Levor* is a greater Obtuseness: *Softness* is a greater thin *Levor*: *Liquidity* is a greater Softness.

CHAP. XV.

Of the Respective Qualities of the Elements; particularly of Fire, Earth, and Water.

1. *What is meant by the Respective Qualities of the Elements. Why they are termed Second Qualities.*
2. *That heat is the second respective or accidental quality of fire. That fire is not burning hot within its own Region. That fire doth not burn unless it flames, is proved by an Experiment through Aq. fort.*
3. *That heat in fire is violently produced. The manner of the production of a Flame. What it is which we call hot, warm, or burning. How fire dissolves and consumes a body into Ashes.*
4. *That Heat is nothing else but a Multiplication, Condensation and Retention of the parts of fire. The degrees of Heat in fire, and how it cometh to be warm, hot, scorching hot, blistering hot, burning hot, and consuming hot.*
5. *A way how to try the force of fire by Scales. Why fire doth not alwaies feel hot in the Ayr.*
6. *Plato and Scaliger their Opinion touching heat.*
7. *The Parepatetick Description of Heat rejected. How fire separateth Silver from Gold, and Lead from Silver.*
8. *What the second respective quality of Earth is. What Cold is. The manner of operation of Cold upon our Taſt.*
9. *The second respective quality of Water. That water cooles differently from Earth.*
10. *Aristotle and Zabarel their wavering Opinions touching Cold. That Earth is the primum frigidum.*

I. The

1. **T**He *Respective Qualities* of the Elements are such, as do con-
secute the congress of the same Elements: They are called
Qualities per accidens, in respect they are supposed to befall them
after their production in their absolute Form. They are withal
termed *Second Qualities*, because they are produced by the *First*
Qualities of the Elements in their congress.

II. The *Second Accidental Quality* emanating from fire in its
concourse to mixture is *Heat*. The manner of production of heat is
accidental and violent: That it is accidental, is evident, because
fire in its own Region (as the *Parepateticks* themselves allow) is
seated beyond all degrees of heat, or at least doth not burn. It doth
not burn, because it flames not; for nothing doth burn unless it is
exalted to a flame, or contains a flame within it self. A red hot Iron
burneth no longer, then the flame of the fire lodgeth within its
pores: nay it doth not so much as effect warmth, unless the fire,
that is contained within its pores, flames a little; but this flame is
so little, that it fleeth the eye-sight. If a red hot Iron burneth strongly,
because it contains a great flame, and the same Iron burneth
less and less, as the fire flaming diminisheth, it is a certain sign,
that where its flame is extinguishd, its heat is vanished with it. A-
gain, none ever doubted, but that in a flaming Torch there is an
actual burning fire: Now tell me, when the flame is ready to go out,
whither that fire goeth. Your Answer must be, that it is disperfed
through the Ayre; but then the fire being disperfed through the ayre
is no more hot; no, not warm, because it doth not flame: where-
fore fire naturally and *per se* is not hot. I ask you again, whether
there is not fire contained in *Aqua fortis*? You will answer me affir-
matively; But then, doth this fire burn? No, it doth not so much as
warm your hand through a Glass. If you make the fire in the *Aqua for-
tis* flame, you will find that it shall not only warm, but also burn your
hand. Powre *Aqua fortis* upon any Metall, as upon the Filings of
Brass, contained in a precipitating Glass, you will soon see it change
into a flame, smoak, and burning heat through the Glass. That it
flames, the light, which appears within the Glass, testifieth.

Possibly you may object, that *Aqua fortis* if powred upon cloath
or your hand, will burn, and yet not flame.

To this I answer, That Cloath through the subtilty of its haire
doth open the body of *Aqua fortis*, which being opened, the fire
cometh forth, and is withheld by a thickned ayre adhering to the
Cloath,

Cloth, which causeth a subtil flame, yet seldom visible, although sometimes there appears a Glance. The like is effected by powring it upon your hand, and then we say, it doth enflame the hand, because there appears a subtil flame: Wherefore Physicians say well, such a part is enflamed, when it burnes, because there is no burning heat without a flame.

Nevertheless the fire contained within a mixt body may burn, and yet its heat may not be sensible, but then its flame is withal imperceptible: The reason is, because the *thickness* and *density* of the circumjacent Elements do hinder the penetration of heat out of that body, as also of its light.

III. It is violent, by reason its production is depending upon an extrinick and violent detention. The manner of it is thus: Fire being violently concentrated in a mixture, striveth to pass the Pores of the earth, which it doth with little difficulty; but being arrived to a thick ayr, the fire is there detained by it, notwithstanding do the other parts yet remaining within the Pores of the earth continually and successively follow one another, and being all united and condensed (which is violent to the fire) they make a greater force (for strength united is made stronger) whereby they dilate and expand the incrassated Ayr; this Dilatation and expansion of the Ayr by fire condensed within its belly or bladder, is that, which we call a *Flame*. Now how fire begetteth heat, and becometh burning, I shall instantly explain.

First let me tell you what heat is. You know that we name all things according to their natures, which they manifest to us in affecting our senses: So we call that a Sound, which affecteth our Eares, and according as it doth divide our auditory spirits and nerves, we nominate it harsh or shrill, &c. Even so we name a thing hot, when it doth in a certain manner divide our tangent spirits and Membrane; or shorter, we say a thing is hot, when it feelles hot. When our spirits are a little shaken, or moved by small and loose Particles of flames, then it seemes to be warm; but when our tangent parts are divided by dense and forcible Particles of fire, then we say, it burns; so that it is only a division of our tangent parts by the dividing and penetrating parts of fire, which we call burning. This division is different from a cut or incision, which is made by a dense acute body, and therefore it separates the whole part; but through the acuteness of fire, its airy and waterish parts only are divided contiguously,

contiguously, because the fire is contiguous. Now the more the parts of fire are condensed, the stronger it penetrates, divides and consumes. The reason, why burning fire doth consume or dissolve a body into ashes, is, because it breakes through the ayry and waterish parts by its great force of contiguous lightness, which parts being discontinued and expelled, the earth is left alone, because the ayry and waterish parts were the glew of that body. Fire doth only break through the ayry and waterish parts, because they only do resist (as it were) the fire; as for the earthy *minims*, they do not so much resist the fire, because being contiguous, they give way to its passing.

IV. Secondly, That heat is nothing else but a multiplication, condensation, & detention of igneous parts, I prove also hence: Hold your hand at a certain distance to a fire, at the first application of your hand, you will feel no heat or warmth, but having held it there a little while, you shall begin to feel warmth, and continuing your hand somewhat longer at the same distance, you will feel heat: the reason is, because at your first application, the fire not yet being sufficiently detained or condensed by your hand, you felt no warmth, but after a certain condensation and gathering of the hot parts of the fire, it begins to move and stir the ayry parts contained within the pores of your hand, and after a further condensation, it makes force, and penetrates through the ayry parts of the hand. Hence when you feel a pricking pain, then you cry it burnes; this pricking is nothing else, but the passing of the fire through the ayry parts, and dividing it in Points and Pricks. The reason, why it doth force so through your hand, is because the ayry parts of it doth condense the parts of the fire. So that according to the multiplication, condensation and detention of the fire, warmth becometh hot; hot, scorching hot; scorching hot, blistering hot; blistering hot, burning, and burning hot becometh lastly to be consuming hot; and these are all the degrees of condensation of fire.

V. I shall not think my labour lost, if I propose a way, whereby to balance and know the force of fire, and to distinguish exactly what fire giveth the greatest heat. In my Road let me tell you, that balancing is a way, whereby to know and compute the force of a thing. The balancing of weighty bodies, as of earth, earthy and waterish bodies, they call weighing, because it is the trying of the force of weight, that is, how much stronger one thing moveth to the

Center then another. Upon the same ground one may as justly term the balancing of light bodies, as of fire and ayr, *lighting*, which is the measuring of the force of bodies from the Center.

Cause a pair of Scales to be made of a thin light matter, as of beaten Tin, or the like, and overlay their convexe parts with a mixture of whites of Egges and Allom; then invert the convexe parts inwards, and the gibbous outwards, and place one Scale over the fire, so as its flame may perpendicularly strike into it, which after a while hanging over the fire, will be forced upward by the light parts of the fire; then put as much weight upon it, as Graines, Scruples, or Drams, as will reduce the Scales to a balance, which after a greater condensation or appulse of new parts, will force the Scales



* The Scales hung perpendicular over the Fire A.

B The Scales inverted.

D Flames upon the gibbous side of the Scale for to place the weights upon.

upwards

upwards again, which you are to depress again to the same equillibre by an equal proportion of weight ; so by this you may discover the purity of fire, and guess what proportion of smoke there is to such a force of fire, besides many other things worthy of your Observation. Moreover note, that the fire must be kindled in a deep Pot or Furnace, because of gathering its parts.

From what hath been discoursed upon a reason may be drawn, why fire, that is inherent in the ayr, is not sensibly warm ; namely, because it is not enough condensed through the ambient Ayr.

VI. Now that you shall not conceit that what hath been proposed is altogether my own Notion, I will adduce the judgment of *Plato* upon this Particular, who although hitting right upon many things, yet they were soon dashed out by the Arrogance of the *Peripateticks*.

In the first place (saith he in *Timæo*) let us consider for what reason fire is said to be hot, which we shall soon come to know, if we do but observe the Division and separation made by it : That it is a certain sharpness and passion is manifest almost to all ; we must consider the subtilty of its Angles, the thinness of its sides, the smallness of its Particles, the swiftness of its motion, through all which it is forcible and penetrating, and that which it doth swiftly meet, it alwaies divides and dissipates : considering also the generation of its figure, that dividing our bodies through no other nature, and dividing it in smal parts doth induce that passion, which is justly called Heat. Here you see *Plato* hath hinted right at many things appertaining to the Notion of Heat. He saith, heat is a passion, that is (as I said before) that, we call heat a certain sensation, induced by the division of fiery *minims*.

2. You may observe, that his opinion asserts heat to be a quality migrating out of fire into the body, which it heateth ; but that it heateth by dividing and penetrating through the diffusion of its small parts.

Scaliger Exerc. 12. d. 3. maintains the heat, which is in red hot Copper, not to be a quality raised in it by the fire, but to be fire in substance contained and condensed between its Pores.

Arist. Lib. 2. de gener. Cap. 2. describes heat to be that, which congregates such bodies, as are of one Genus : For (saith he) to segregate (which is that which they say fire doth) is to congregate congenited bodies, and such as are of the same Genus : for it is accidental

that it removes strange bodies. His Followers propose the same in other words, viz. Heat is a quality, through which homogeneous bodies are congregated, and heterogeneous disgregated.

I object against this, that fire is hot; but fire doth through liquation mix Brasse and Silver together, Grease and Oyl, Wine and Water, &c. But these are not bodies of one nature; Wherefore fire doth not alwaies disgregate heterogeneous bodies.

2. The heat of a Potters Oven congregateth Ayr, Water and Earth together; but Ayr, Water and Earth are heterogeneous Bodies; Ergo.

3. If heat congregates homogeneous Bodies, then the hotter a thing is, the more it must congregate homogeneous Bodies: but the Consequence is false, and therefore the Antecedence is false also. The falsity of the Consequence appeares hence, that if the body of man be hotter then its *temperamentum ad justitiam* requires, then it gathers and breeds heterogeneous humors in the Bloud, as Choler, and adust Melancholy.

4. The heat of the Sun raises mud and other heterogeneous bodies in the bottom of waters, and causeth them to congregate and unite with the body of the same waters.

5. Some of his Sectators demonstrate the reality of this effect of fire, in that it congregates Gold through liquation, and so separates Silver and other Metals from it.

To this I answer, that the same heat having exactly mixed them before, can as well, if intended, re-unite them again, as it hath separated them. Neither is this separation any other but *per accidens*, although the union is *per se*. I prove it, It is true, at the first melting there is a kind of Separation of Silver from Gold, and of Lead from Silver: but this befalleth accidentally only; for the Silver is separated from Gold, and Silver from Lead, because Silver being melted before Gold, and Lead before Silver, and the Gold remaining as yet unmelted, and silver also after the Liquation of Lead, they must of necessity sink down through the first melted parts of Silver and Lead, as being yet unmelted: for Silver, which is contained within the body of Gold, will be melted and attenuated within its body, before the Gold it self is scarce mollified, whose parts being now mollified, through their dense weight squeeze the Silver out of their Pores. Wherefore this separation is effected by the fire *per accidens*; but augment your heat to such a degree as to melt your

your Gold, then cast some more Silver to it, and see whether they will not mix. I believe you will find it so. Lastly, This is not a Description of heat, but the mentioning of one of its Effects; for heat formally is another thing.

VII. The *Second quality per Accidens* of earth is, a punctual violent compression to the Center. As the earth doth meet the fire in its first quality, so it doth also in its second. Earth when it is violently detained from its Center, it doth punctually compress that body, which doth detain it, towards its Center. If you take up a handful of Sand from the ground, doth it not compress your hand downwards?

Likewise the pressing downwards in all bodies proceeds from the detention of earth in their bodies. Observe; cast earth upon earth and it will hardly compress its parts any more then it was compressed before; but a stone, or other mixt heavy body lying upon the ground presseth a hole into the ground; yet if as much more earth, as there is contained in such a stone, were cast upon the same place, it would not make any sensible cavity or Impression: the reason is, because in a stone or mixt body the earth is violently detained, and therefore useth the greater force or compression to the Center: but earth being in its natural seat doth not. This quality may be called coldness, supposing it to be a passion wrought upon the tact by the earth punctually pressing to the Center: In this sense coldness is an absolute quality; in another it may be taken for a privation of heat, because it seizeth upon the tact only in the absence of heat.

According to the former sense doth the Poet elegantly explain the nature of Cold:

— Nam penetrabile frigus adurit.

For the penetrating cold doth burn. By penetrating, its compression is intended. That the cold is penetrating and pressing, none that ever hath been in *Greenland* will deny, wherefore in that it is an absolute quality. In the latter sense it may be taken for a privation: for it is the absence of heat, which effecteth Coldness, yet not *per se*, but *per accidens*, because as long as the heat is in a body, it doth through its motion *ad extra*, balance and temper the motion of cold *ad intra*; but the heat being departed, then coldness doth through its compression punctually divide the continuous parts of the

the body, as the airy and waterish parts of it, and so coldness is reduced to action through the defect of heat to balance it. This we are sensible of in the Winter, at which time there being a detraction of the ambient heat, the earthy parts contained in the Air, do then through their weight press down upon us, and being arrived to our skin, they repel the heat, which being repelled, they joyn with the earthy parts of our Body, and so cause a greater punctual compression; whence we soon feel a dense acuteness, thence an asperity, and thence a hardness or rigidity. When again we approach the fire, then its heat joynes with our internal heat, and expelling the extrinsec cold parts, it doth force the intrinsic ones back to the Circumference, and so we grow hot again.

VIII. There is also a Compression observable in water, but much different from that caused by earth, water compressing the tact with a continuation, and not punctually, and therefore the compression made by water is equal, thick and obtuse; whence it is, that when we have newly washed our hands with cold water, we feel a thick levor upon them, caused by the continuous pressure of the water. The division, which produceth this cold passion in our tact, is not by separating or disjoining its continuous parts, but by squeezing the Air contained within its pores, which being squeezed, impellerth also the fiery spirits seated about these Pores; from which impulsion we feel a punctual and acute division, so that the passion raised by water doth *per se* only compress obtusely the continuous parts of our tact through a squeezing, and *per accidens* it disuniteth them punctually by impelling the fiery spirits essentially inhering in the said tangent parts; besides, water containing some earthy points, doth by reason of them excite withal a small acute compression.

Arist. Lib. 2. de ori. anim. Cap. 4. and in *Lib. 1. de Meteor. Cap. 4.* seemes to assert, that coldness is nothing else but a privation of heat: For (saith he) the two Elements (implying water and earth) remain cold by reason of the defect of circular motion making heat.

Zabarel, Lib. 2. de qual. Elem. cap. 3. makes good my Opinion, although by guess: or at least we must say that coldness is really in itself a positive quality (but wherein this positive quality consisteth, he knoweth not;) but that it ariseth from a privation of heat, and in respect of heat it may take place among privations. This tends to the same purpose as I have stated before, namely, that coldness cannot act,

act, unless heat be absent in such a proportion, as that it may have power over it. The same is applicable to heat and the other qualities, viz. that they are privations, in regard they cannot act without the absence of their Opposites, but that they are positive, because they act sensibly in the absence of the said opposites.

But what shall I think of *Aristotle*, who hath soon altered his opinion in *Lib. 2. de Ort. & Inter. Text. 9.* Cold is, that doth equally conjoyn and congregate bodies, that are of the same Gender, as well as those of a differing Gender. A plain Contradiction; for that, which doth conjoyn and congregate bodies by condensation, must be positive, according to his own words: yet nevertheless above he asserted it to be a *Privation*. I waive this, and proceed in making disquisition upon his Definition; Broath, as long as it remains boyling hot, the fat of it is contained within it, being exactly mixed with the water; but as soon as it cooles, it is separated and cast forth to the top; ergo cold doth segregate *heterogenea* from *homogenea*. Earth separates her self from water, and water segregates her parts from fire and ayr; but water and earth are cold, and yet do not congregate their own parts with others of another gender; *Ergo*.

2. This is no more but the mentioning of one of its remote effects; for they themselves grant that it produceth this effect through condensation; ergo cold is not formally defined, but described through one of its effects.

It now proves easie to us to decide that inveterated dispute concerning the *primum frigidum*. That, which doth most divide the tact by compression, is the *primum frigidum*, or the coldest; but the earth doth most compress our tact or tangent parts; for it doth compress the tact acutely, and water obtusely only; ergo it is the coldest.

2. According to their own Tenenes; that, which doth most condense, is the coldest, but earth condenses most; for it condenses her own parts into Metals and Stones; but water, although it incrassates, yet it cannot condense bodies into that consistence which earth doth; ergo.

3. That, which is heaviest, is the coldest; for condensation is an effect of weight; but earth is heaviest; ergo.

Lastly, If it be your pleasure to name Earth a *frigidum in summo*, and Water a *frigidum in remisso*; Fire a *calidum in summo* sive intensio.

intenso, and *Ayr calidum in remisso*, you may without Offence.

CHAP. XVI.

Of the remaining Respective Qualities of the Elements.

1. The Second Respective Quality of the *Ayr*. That water cannot be really and essentially attenuated. The State of the Controversie.
2. That *Ayr* cannot be really and essentially incrassated. Why a man whilst he is alive sinks down into the water and is drowned, and afterwards is cast up again. That a woman is longer in sinking or drowning than a man. The great error committed in trying of Witches by casting them into the water.
3. That a greater Condensation or Rarefaction is impossible in the Earth.
4. In what sense the Author understands and intends Rarefaction and Condensation throughout his Philosophy.
5. The third Respective quality of Fire. What Driness is. The Definition of Moisture. The third respective qualities of Water and *Ayr*. Aristotles Description of Moisture rejected. That water is the *primum humidum*. In what sense *Ayr* is termed dry, in what moist.

1. **T**HE Second Respective quality of *Ayr* is a continuous expression towards the Circumference, as we see in water, viz. in bubbles, within whose body *ayr* being contained doth express the water to the Circumference. When water is thus expressed to the Circumference, we say then, it is water attenuated or rarefied, and when *ayr* is contained within the body of water, so as it is not strong enough to come forth, we say it is *ayr* incrassated: but these are no real transmutations. For can any body imagine that *ayr* is really and essentially incrassated or condensed, as they call it, or that water is attenuated, or essentially changed into a thin substance by *ayr*? I prove that a real incrassation of the *ayr* is impossible. *Peripateticks* generally conceive the incrassation of the *ayr* to happen, when that

ayr

ayr having thinly or naturally filled up a cavity, there is as much more impacted in that cavity upon the preceding ayr, as the cavity contained before: Through this impaction the former ayr must needs give way into it self for to admit that ayr, which is last entred; wherefore, say they, there must be a penetration of bodies, whereby that former ayr doth introcede into it self. The ayr then thus introceding into it self, is called ayr *incrassated*. Water is attenuated when a Pint of water is diducted to a Pint and a quarter, or more, without being insufflated by the ayr or any other admitted body. So rarefaction of earth is, when the earth possessing the space of a Pistol Bullet, is diducted to the extent of space of a Musket Bullet without the admission of any other Element. Fire is supposed to be condensed in the same manner as Ayr is *incrassated*. This is the true and evident state of the Controversie touching *Rarefaction* and *Condensation*, *Attenuation* & *Incrassation*; which never any among the *Peripateticks* did yet truly state. They supposing and taking it for granted, that such a *Condensation* & *Rarefaction*, *Attenuation* and *Incrassation* is possible, and hapneth every moment, do proceed in debating, whether a penetration of bodies be not necessary in *Rarefaction* and *Condensation*. As for *insufflation*, that is not to be called in question, because we stated *Incrassation* and *Rarefaction* to happen without the admittance of any other body. Wherefore proving such an *Incrassation* and *Attenuation* to be impossible and absurd, their further surmising of penetration will seem ridiculous. Supposing that a Glasse were filled with pure water, all the Arts of the world could not distend it without the admission of another body, through the force of which, its parts might be divided and lifted up: Since then that water is said to be attenuated, because its parts are lifted up & diducted through Ayr and Fire retained with their body, this cannot be a natural and proper attenuation of the real parts of water, but only a violent diduction of water through the ayr which is under it.

Here may be objected, That water, when it is thus lifted up and expanded, is stretcht, and through that stretching its parts are attenuated, and its quantity is increased; because after the stretching it possesseth a larger place.

To this I Answer, that the encrease of quantity about the Surface is not through a single extent of water without access of other parts of water to it, but the encrease is from the access of those parts, which did possess the Center, and now are beaten away and impelled

led to the Surface, where arriving they must be extended in greater quantity, and possess a larger place, so that, what is increased in the Surface is decreased from the Center, and its adjacent parts. A Chord of an Instrument is produced in length, because it is diminished in thickness, and not from a meer quality without the Access of other parts.

2. Were the natural thickness of water transmutable into thinness, then one extrem contrary would be transmutable into the other; for thinness and thickness are as much contrary as coldness and heat, or dryness and moisture; and who ever knew the same coldness changed into heat, or the same heat into coldness? That would be, as if one said, one and the same was both cold and hot at the same time. I guess your Reply, to wit, that through Thinness is not meant an extrem Thinness, but a less Thickness only. I answer, That if a thick Element is transmutable into a less thick, then certainly through the continuance and intention of the cause of that less thickening, it might become least thick, that is, most thin: wherefore your Reply is invalid.

3. Were thickness transmutable into thinness, then every rarefaction would be a creation *secundi modi*, or a new generation; because such a transmutation is a *non esse, vel a nihilo sui ad esse aliquid*: for thickness is a positive (if I may be suffered to term it so) privation and negation of thinness; because when we affirm a thing to be thick, it is the same as if we said it is not thin.

4. Thickness is a property *quarti modi* of water, but a *proprium quarti modi* is inseparable from its Subject, and that to remain in being.

II. The same Arguments prove the impossibility of incrassating Ayr, and such a supposition is so far absurd, that it is impossible and contradictory to Nature, that one *Minimum* more of Ayr should enter into a Cavity already filled up with it; and the ayr would sooner break the world then admit incrassation, although but in one *Minimum*. If the nature of ayr is to be thin, then in taking away tenuity, you take away the nature of Ayr. And if ayr could be incrassated in one *minimum*, it might be incrassated to the thickness of water. Lastly, was there any such incrassation, there must of necessity a penetration of bodies be allowed; but a penetration is impossible: ergo Incrassation also. I prove that a penetration is impossible: Suppose a hundred *minima's* of ayr were through penetration

neration incrassated to fifty, and these fifty to possess but half the
 place which the hundred did fill up: I conclude then, that through
 continuance and intention of the same incrassating cause they
 could be reduced to one *minimum*, and from one *minimum* to the
 essence of a spirit or to nothing; for since they through penetration
 have lost the space of Ninety nine unities of points, through the
 same reason they might the easier lose the last unity, and so become
 spirits and thence nothing; if there was a penetration of bodies,
 then the less body, into which the greater quantity is penetrated,
 must have the greater weight, or as great as it was under the greater
 quantity, or else part of its *Matter* and *Form* must be annihilated;
 but bodies, that are incrassated or condensed have by much a less
 weight then they had before, because the light elements, which
 did before distend their bodies, and through that distention their
 force of weight was intended (as I have shewed before) are depart-
 ed. Besides Experience speaks the same, especially in this Instance,
 the true reason of which was never laid down by any: a man yet
 living, or any other creature when alive, is much heavier, then when
 he is dead; and this appears in a man, who whilst he was alive
 sinks towards the bottom into the water and is drowned; the reason
 is, because through the great heat, which was inherent in that man,
 the heavy and terrestrial parts were the more detained from the Cen-
 ter; they again being thus detained, moved stronger towards the
 center, & therefore make the body heavier during their violent deten-
 tion through the great heat, which was in the said man when alive;
 so that through this great weight the alive body sinks down to the
 bottom: now when a man is suffocated, and the heat squeezed out
 of him by the thick compressing parts of the water, then he is ren-
 dered less heavy, and immediately leaves the inferiour parts of wa-
 ter, as being less weighty then the said profound parts. Neverthe-
 less although the vital flame was soon extinguishd, yet there remain
 airy and some fiery parts in man, which detain the earthy and wa-
 terish parts of his body; so that although the vital fire is expelled, yet
 these airy and resistant fiery parts not being overcome before a certain
 term of dayes, in some sooner or longer, occasion that a man doth
 not grow lighter then the water before a prefixt time varying accor-
 ding to the proportion and texture of the light elements; and then
 being grown lighter then the water, he swimmeth atop. Every day
 after a man is drowned, as the heat and airy parts are expelled, he

is more and more elevated from the ground, until he cometh to the top. A strong compact well set man is at least 8 or 9 daies in ascending, because his heat was deeper, and in greater quantity impacted into his body; but therefore sinks sooner to the bottom, as I have heard Seamen relate, how that some of their men falling overboard, were gone under water in the twinkling of an eye, but then they were big, lusty strong men, as they told me. On the contrary we hear, how that weak and tender women have fallen into the River, and have swum upon the water until watermen have rowed to them, and taken them up (and many weakly women that were suspected to be Witches, being cast into the water for a trial have been wickedly and wrongfully adjudged to be Witches, because they were long in sinking, and as it is natural) the reason was, because they were comparatively light: for their earthy parts were not so much detained, & consequently moved not so forcibly downwards, no doubt but their Coats conduced also somewhat to it. Whence I collect that an ordinary woman is almost one third longer descending to the bottom then an ordinary man, because a man from being a third stronger (because he is a third heavier through the force of the light Elements, but I mean not through fat or corpulency) then a woman, is conjectured to have one third more heat then a woman. In case a man or woman is drowned in the Sea where it is deep, if he be suffocated and dead before he comes to the ground, he will not reach the bottom. But to make this more clear, I will demonstrate it through another Principle, *viz.* the lightness of fire, and ayr; which is, whereby they spread themselves equally from the Center to the Circumference. Now, that great heat burning within the body of man doth potently press down all the heavy parts of the body towards the Circumference. The ambient or external parts of man are the Circumference, which being so vigorously pressed, must needs be very much intended in their motion downwards: hence it is, that, when a man is in sinking, he feels a pressing within his own body, whereby he finds himself to be violently (as it were) precipitated to the bottom: and add to this the violent detention of the weighty parts, and the depression of the superficial parts of the water, and judge whether all this is not enough to draw him down to the bottom.

Pray now judge a little at the simplicity of the reason which the *Empiricks* give for this: They say that there is a fight between

mans

mans heat and the water, and therefore the water draweth him to her innermost part, where she detaineth him until his heat is overcome, and then the water casteth him up again: Others say, that mans Lungs being filled with ayr underneath after he is drowned, is lifted up by it. What groapings and absurdities?

First, They suppose that the water draweth, and that the fight is between the heat of man and the moisture; whereas the water doth not draw, neither is the fight so much between the water and heat, as it is between the heat and earthy parts of the body, which with the natural declination of those terrestrial parts, and the assistance of the water from without doth depress a man or other living creature downwards.

2. Why a man is detained such a time and no longer or shorter before he is cast up again, they cannot conceive.

3. How man is cast up is unknown to them: it is not, because his Lungs are filled with Ayr; for it is more probable they are stopp'd up with water.

The reason and manner of his being cast upwards is,

1. His body is rendered less weighty by the expulsion of the heat.

2. His body is retch'd out and diducted through the coldness of earth and especially of the water, and therefore is rendered lighter, for as compression and condensation is a mark of weight, so diduction and extension of lightness. Wherefore every particle of water being thicker and heavier then the extended body doth depress underneath it towards its center, and so much the more, because the dead body doth as it were detain the parts of water about it from their center: and so through this depression of the water under the Corps, it is lifted up by little and little: Besides, it is somewhat puffed up with winds and vapours underneath the water, which thence do lift it up towards the Element of Ayr.

The reason why a Dog, Cat, Hire, Fox, Horse and other living Creatures, are longer in being drowned, although they have more heat inherent in them, and as much earth comparatively as a man, is because their haire being light, close and divided, do sustain them: for the water being continuous, doth strive against its being divided by contiguous parts, which being light, strive also against their depression. This by the way.

III. Neither is the earth subject to such a *Rarefaction*, or greater *Condensation*, because it consisteth (as I have proved) out of indivisible

fible *minima's*. If then we should grant a rarefaction or greater condensation, we must allow the *minima's* of earth to be divisible: for how could they either be retch'd or give way into themselves else? and so it would be divisible and indivisible at once, which is absurd. The same Argument serves against the condensation and rarefaction of fire: But more of this in our Discourse *de vacuo*.

IV. Condensation, Rarefaction, Attenuation and Incrassation although impossible in this sense, yet in another, are usually received, and may be allowed.

Condensation in a tolerable acception is, when a rare body is united to a dense body, and because it is then (as it were) made one body with the dense substance, it is said to be condensed. Thus when fire is united to earth, it is said to be condensed, but through this condensation there is nothing detracted from, or added to the natural rarity of the fire.

2. Condensation is also taken for the frequent and constant following of one particle of fire upon the other. Now, you must not conceive, that the fire hereby is condensed or impacted in its rarity; no, but that one part pusheth the other forward, and being so pushed forward one before the other, they are said to be condensed, that is following one another so close as that they just come to touch one another. Thus we say that condensed fire warmeth or heateth the hand, because many parts follow one another, and so push one another forward into the substance of the hand; so that condensation of fire in this sense is nothing else but an approximation of the parts of fire that were dispersed before.

2. Fire burneth the hand, when its parts being condensed according to both these two acceptions are received and collected, following close upon one another, and so do burn the hand. The reason is, because as the force of earth and water is intended by violent detention, so is fire, which being violently detained by earth and water, doth move with greater force. Besides through the latter of these condensations, the parts of fire are more collected and united. The fire is violently detained, when it is detained from moving from the Center to the Circumference. Besides, according to these two latter acceptions, you are to understand condensation above, whereas I have attributed it to fire.

A body is said to be rarefied, when it is affixed to a rare element; thus they conceive earth to be rarefied, when its *minima's* are diffused by a portion of fire.

A body

A body is attenuated, when it is united to a thin Element; so water is attenuated, when its parts are diducted through the tenuity of Ayr.

A body is said to be incrassated, when it is adjoynd to a thick Element. Thus Ayr is understood to be incrassated, when it is cloathed about with water.

Remember that I have made use of these words in my foregoing Discourses according to the said Interpretations.

V. The *Third Relative Qualities* are such as do immediately emanate from the Second.

The *third respective Quality* of fire is *Dryness*. A *Dryness* is an expulsion of Moisture, which fire doth by forcing it to the Circumference, and dividing *ad extra* its continuity.

Dryness in the earth is an effect of coldness, through which it divides *ad intra* the continuity of moisture inwards, and forceth it to the Center.

Moisture is an effect of water, through which it overlayes a body with its own thick substance expanded: in ayr it is a *quality*, whereby it overlayes a body with its thin substance.

Aristotle in stead of describing these qualities, he sets down one of their Attributes. *Moisture is that, which is difficultly contained within its own bounds, and easily within others.* This is openly false: for the ayr is difficultly contained within the bounds of others, inasmuch that it striveth to break through with violence, and therefore is more easily contained within its own bounds. So water is easier contained within its own bounds; for when it is poured upon the earth, it vanisheth presently, which is not a containing of it. Besides granting this Attribute to them both, it is only a mark of Moisture, and not the Description of its formality.

No doubt but water is moister then ayr, because it is more apt to cleave through its thickness, and adhere to a body then ayr, which by reason of its tenuity is not so tenacious. Wherefore it is Idleness in those who say that the ayr is moister then water, although water moistneth more, because of its thickness.

And as concerning the *primum siccum*, it belongeth to the earth, because that obtaineth greater force in detracting waterish moisture, which is the moistest. That it doth so, appeares hence, because the waterish moisture through its weight is more obedient to the impulse of earth then of fire. But if you agree to term nothing

thing moyst but what hath a palpable Dampness; and that drying, which removeth the said dampness, then water alone is moystning, and ayr drying, because ayr through its tenuity divides the crassitude of the water, and so disperseth it.

CHAP. XVII.

Of Mixtion.

1. *What Mixtion is. Three Conditions required in a Mixtion.*
2. *Whether Mixtion and the generation of a mixt body differ really.*
3. *Aristotles Definition of Mixtion examined. Whether the Elements remain entire in mixt Bodies.*
4. *That there is no such Intension or Remission of Qualities as the Peripateticks do apprehend. The Authors sense of Remission and Intention.*
5. *That a Mixtion is erroneously divided into a perfect and imperfect Mixtion.*

Hitherto we have sufficiently declared the absolute and respective Qualities of the Elements: That which I must next apply my self unto, is to enarrate the qualities befalling them joynly in their union one with the other.

I. Their union is called *Mixtion*, which is an union of the Elements in *Minima's* or Points, Observe that mixtion sometimes is taken for the union of parts, not in points, but particles, and is termed *Union by Apposition*; as when you mixe Barly and Oates together into one heap.

Anaxagoras, and many of the ancient Philosophers did opinate, that *Mixtion* consisted only in the apposition of little parts to one body; but *Aristotle* hath justly reprehended them for this Assertion, and confuted their Opinion, *Lib. 2. de Gen. & Corrup. Cap. 10.*

Properly *Mixtion* is effected through an exact confusion of parts, and their union in *Minima's*, or the least particles: the exactness consisteth in this, that there must be an equal measure (*sive ad pondus*).

du, five ad justitiam) of parts. Parts are either little or great. The great are constituted out of little, and the little out of the least.

In mixture (to wit, an equal one) are generally three conditions required :

1. A mutual contact, without which there must be a *vacuum* in (*misto*) a mixt body.

2. This mutual contact must be in points, whereby every point of an Element toucheth the *minimum* of another; hence they say well (*mixtio fit per minima*) that mition is caused through *Minima's*.

3. A reaction of each of the elements, whereby the light Elements receive the weighty ones, and the continuous the contiguous ones.

These three conditions are implied in my Definition by *union in minima's*; for union cannot happen without a mutual contact: A mutual contact is attained unto through the first qualities of the Elements, whereby they move one to the other, and so there passeth a mutual embrace or reaction between them.

II. Here the *Peripateticks* setting aside the reality of the thing, begin again to move a notional question: whether mition and the generation of a mixt body differ from one another. Doubtless there is no real difference between them; for where the Elements are mixed, there the generation of a mixt body is accomplisht, and where there is a generation of a mixt body, there is also a mition of the Elements. Wherefore it is a sound Definition, that *mition* is the generation of a mixt body out of the Elements.

Zabarel, I remember, makes an intentional difference between them, in attributing mition to the Elements alone, because mition hath a particular respect to the Elements, as they are apprehended through this mixture to be the *termini a quo*: but the generation of a mixt body hath more a respect to the *terminus ad quem*. This is simple; for since that mition is by them counted a motion, it must then equally have respect to the *terminus a quo* and the *terminus ad quem*, because there is no natural motion, but it moves *a quo*, and *ad quem*; and besides, do they not define Generation to be a mutation from *non esse* to *esse*? Wherefore according to their own words, generation doth equally regard the *terminus a quo* and *ad quem*; ergo there is no *distinctio rationis* between them. But they

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reply,

reply, that mixtion is not the mixture of a mixt body, but of the Elements; and generation is not the generation of the Elements, but of a mixt body. How sinisterly? This is not the question, but the doubt is, whether by mixture a mixt body is not as much implied as the Elements: Yes, for a mixture is the union of the Elements: By union understand a perduction of the Elements into an unity, that is one body; and is not this the *terminus ad quem*?

III. Aristotle defineth *mixture* to be an union of alterated miscibles (to wit, bodies.) Here the word *alterated* is cast as a Bone among his Disciples, which each of them falleth a gnawing in interpreting it, and a knowing at it in raising altercations and cavils about it. *Alteration* say they, is a mutual action and passion of the Elements through their contrary qualities, through which they obtund, hebeate, refract, immutate one another, and what not? And not understanding the nature of obtusion, refraction or immutation, but erroneously conceiving the forms of the Elements to be diminished (by reason they think that the heat of the Elements is expelled, refracted and diminished by cold; and so of the other Elements) they fall a quarrelling, whether the forms of the Elements remain whole or entire in their mixtures. If any body now should ask them, what they mean by form; they would reply, that it was the first principle of motion in a body; and if you ask them further, what that principle of motion is; they will tell you it is hidden; If it is hidden, I wonder how they come to know it; *ergo* they tell you what a thing is, which they do not know. But to the question, I affirm that the elements remain actually and entire in their substantial forms in mixt bodies. I prove it, the substantial *form* of a thing is inseparable from its *matter*, supposing the thing to remain that which it was: for if a property is inseparable, much more is the *form*: Besides the *form* giveth a thing to be that which it is: But the elements remain elements in a mixt body; because their qualities are sensible, not in *gradu remisso*, in a remiss degree, but in an intense degree; Who ever doubted, but that earth in Gold or Lead is as weighty, and more then it is in its own Region? for being laid upon the earth it makes a Dent into it; *ergo* it is heavier.

Questionless focal fire is hotter then fire in its own Region; Oyl is moyster then ayr or water, *ergo* according to their own Principles these qualities, which they call *first qualities*, and are forced to acknowledge to be *forms*, are inherent in the forementioned bodies.

bodies in an intense degree. As for the Refraction, Intention, Remission or Immutation of the Elements, which they take their refuge unto in declaring the reasons of Mixtion, as to a Sanctuary, are meer Notions, there being in reality no such intension or remission of the Elements, unless through access or recess of new parts.

IV. But let us make a deeper search into this Nicety so much disputed upon by all Ancient and Modern Philosophers: and that which makes me the more willing to examine this scruple, is, because it hath hitherto been one of my main Principles, *That an Element being violently detained is intended and corroborated in its strength and power.* This is the deepest and furthest doubt that can be moved, it being concerning the most remote power, and first cause of action in the Elements.

I have already taken away the difficulty touching *Incrassation* and *Attenuation*, and shewed, that the *Matter* of a thick Element was not really attenuated in its own substance, or increased in *matter*, because it possessed a larger place, although seemingly it was; wherefore I did assume the use of those words but in an improper acception. In that place the question was about the increase of *matter*; now it is concerning the increase or intention and remission of *Forms* or *Qualities*, strengths and vertues of the Elements. The same I said in relation to *Condensation* and *Incrassation*, I must apply to *Intention* and *Remission*: that properly they are to be taken for a real increment or decrement of qualities in themselves, without the detraction or addition of new parts containing the same vertue; as if the same heat in the third degree should be supposed capable of being intended to the fourth degree without the additament of new heat. This is impossible, because of the same reasons, which were given against the possibility of a proper and real *Condensation* and *Incrassation*.

2. A quality may be said to be intended or remitted, but improperly and *per Accidens*; as when a force or quality is accidentally intended (as by a more convenient position) and yet the quality or force is neither more or less, but the same it was: As for example, Take hold of a Hammer about the middle, and strike with it with all your strength, and take hold again of the same Hammer about the end, and strike although but with the same force, yet the last impulse shall be stronger then the first: Here you see is an accidental intension of force hapened through a more convenient position of your hands.

So water, when it is violently detained, is intended in its *gravity*: because its expansion (which is a more convenient position) doth intend its motion, and yet the same strength and force of *gravity* was latent in the water, when it was in its natural position. Water doth alwaies affect and cover a globous figure; now through this globosity the water is rendered disadvantageous to exert its weight, because all its parts cannot joyn together in opposing the body, which it is to depress; but being in a Globe the undermost parts of that Globe do partly sustain the force of the uppermost and central parts, and the same undermost parts being interposed between the other body, and the other parts, cause that the others parts cannot come at the body. That this is so, the trial of this Experiment will soon certifie you; weigh some long pieces of Iron or Wood in a payr of Scales, and observe the weight of them; then divide them into less pieces, so as they may lie closer, and weigh them again, you will find that the last shall be much lighter then the first; besides I have tried it many other waies. This Reason will also serve to illustrate the manner of intention of weight in earth, when it is violently detained.

Ayr moveth stronger upwards, when its parts are more divided and expanded; for then every particle of the ayr contributes its motion; and so in fire. Nevertheless the same force was actually in the ayr and fire below. In this sence it is I have made use of *Intention of Qualities* above in the Precedent Chapter.

Wherefore it appears hence, that there is no such refraction or intention of qualities, as the *Peripateticks* imagine to themselves.

V. A mixt body is usually divided into a body perfectly mixed, and a body imperfectly mixed, and as usually received among the Vulgar; but whether this Division be lawful is doubted by few. An imperfectly mixed body they describe to be a body, whose mixture is constituted only by two or three elements; a great error, there being no body in the world, excepting the elements themselves, but their mixture consisteth of four Ingredients. This I have proved before. Others think to mend the matter by saying, that an imperfect mixed body consists of Ingredients but a little altered, and therefore its *form* is not different from the element, which predominates in it. To the contrary, the Ingredients in imperfectly mixed bodies are as much altered as there is vertue in them to alterate

rate one another : and who will not assert the *form* of a Comet to be different from the *form* of fire, or Snow from the form of water? &c. There is no mixed body, but it is perfectly mixed ; for if it be imperfectly mixed, it will not constitute a mixt body. 'Tis true, some mixt bodies contain a fuller proportion of Elements then others, and therefore are more durable, and may be of a more perfect proportion, yet the mixture of a body, which lasteth but a moment, is as much a miftion as that, which lasteth an age, and consequently as perfect in reference to mixture.

CHAP. XVIII. Of Temperament.

1. *That Temperament is the form of Mixtion. That Temperament is a real and positive quality.*
2. *The Definition of a Temperament. Whether a Temperament is a single or manifold quality. Whether a complexion of qualities may be called one compounded quality.*
3. *Whether a Temperament be a fifth quality. A Contradiction among Physicians touching Temperament. Whether the congress of the four qualities effects but one Temperament, or more.*
4. *That there is no such thing as a Distemper. What a substantial Change is.*
5. *What an Alteration or accidental change is. That the Differences of Temperament are as many as there are Minima's of the Elements excepting four.*

I *The Form of Miftion is Temperament. I prove it. That must be the Form of Miftion which doth immediately result out of or with the union of the elements ; but a temperament doth immediately result out of or with union of the Elements ; Ergo.*

2. Since there is no deperdition or refraction of the absolute forms of the Elements, that must needs be the *form* of Mixture, which the union of those absolute forms doth immediately constitute : but that can be nothing else but a *Temperament ; Ergo.*

3. That is the *form* of Miftion, which chiefly causeth all the operations,

rations and effects produced by a mixt body; but the chief cause of all the operations and effects of a mixt body is the *temperament*; ergo. The *Minor* is asserted by all ingenious Physicians. Hence we may safely infer, that a *temperament* is not a relative only, but a positive and real *quality*; for were it only a *relation*, its essence would wholly depend from the mind, and be little different from an *Ens Rationis*.

II. A *Temperament* is the union of the *forms* of the Elements. By union apprehend the forms of the Elements united into one quality. The name of *temperament* soundeth a temperating or mixing, yet not primarily of Matters, but principally of Forms; for none doubteth of its being a quality, or formal power.

Kyper, in his *Medic. contrakt. Lib. 1. Cap. 3.* alledgeth this doubt, whether a *temperament* be a simple or manifold quality: but before I apply my self to the solution of it, observe that simple may either have respect to the *Matter* (*materia ex qua*) out of which a *temperament* is constituted, which are the four *first qualities* or *forms* of the Elements; or to the *form* of a *temperament*, which is one quality resulting out of the union of its materials. Wherefore if *simple* be taken in the former respect, doubtless a *temperament* is a manifold quality; if in the latter, it is simple. I prove it: *simple* in the latter respect is equipollent to *unity*: but a *temperament* is but one quality, and not manifold; although out of many, yet united into one; ergo a *temperament* is a simple quality.

2. Were a *temperament* formally a manifold quality, its effects would be equivocal and manifold; but to the contrary the effects *per se* of a *temperament* are univocal and simple, the one not differing in *specie* from the other.

The said *Kyper* proposes the very words of my Solution for a doubt in the next Paragraph: whether complexion of qualities may be called one compounded quality: which he determines very well: In *Metaphysicks* (saith he) there is not only allowed of an unity of simplicity, but also of an unity of composition; wherefore it is not repugnant, that there should be an *unum compositum* of qualities, since there is an *unum compositum* of substances.

III. This puts me in remembrance of another controversie, which I have formerly read in *Mercat. his works, Lib. 1. Part 2. de Elem. Class. 2. Quæst. 39.* whether a *temperament* be a fifth quality, or rather a Concord or Harmony of the four Elements? *Avicen* defines

it a fifth quality, to which the said Author subscribes; but *Fr. Vallesius*, *Lib. 1. Cap. 6. contra Med. & Phys. Fernel.* and others oppose it. To decide a Controversie agitated by the greatest of Philosophers and Physicians, needs a deep inspection: Wherefore I demand what they understand by a fifth quality? whether a quality really, or modally only differing from the four single qualities of the Elements?

2. Whether the Authors of the contrary opinion intend by *Harmony* or *Concord* any thing distinct from the single qualities of the Elements? There is none I find answereth to this; which compels me to handle the Question, in supposing the one party to mean by a fifth quality, a quality really distinct, and the other by *Harmony* of the Elements, to intend nothing distinct from the elements being united in a proportion.

A *temperament* is not a fifth quality really distinct from the qualities of the elements; because a *temperament* cannot exist without the four qualities of the elements; for take away but one of those qualities, and you take away the *temperament*.

A *temperament* formally is not a Harmony or Concord only, because a Harmony or Agreement of the four qualities is an Accident or condition following or attending the union of qualities: Wherefore a harmony of the said qualities is an Accident or *Mode* differing modally from a *temperament*; for when we conceive a *temperament*, we do not conceive a harmony, although we conceive a harmony to be a *conditio sine qua non* of a *temperament*; because without it they could not be united.

A *temperament* is not a proportion of the Elements, but the union of the Elements in a proportion.

A *temperament* is a fifth quality modally distinct from the elementary single qualities, but not really; for a *temperament* is the union of four qualities in one; wherefore this one quality is the same really with the four united, although modally different.

2. A *totum* is modally only, and not really distinguished from its parts united; but a *temperament* is a *totum*, and the qualities united are the parts united; *Ergo*.

I cannot but strange at many Physicians, defining a temperament to be a harmony, and yet asserting the first qualities to be contrary. A Contradiction: For if the first qualities be contrary, they expel one another out of the same Subject, but if they are harmonical, they

they will embrace and preserve one another in their beings, which that they do, is abundantly demonstrated above.

Others again assert, that a *temperament* doth include an union, not only of the first qualities, but also of the substances of the elements. A Dulness ! Wherein would a temperament then differ from Mixture ? Had they affirmed that mixture did imply or include a temperament, it would have been an Heroick Saying not to be expected from them.

Whether from the congress of the four qualities there result two temperaments, one out of the active qualities, the other of the passive, is a further doubt objected by them.

In the first place, they are deceived in distinguishing the first qualities into active and passive qualities ; because among them the one is no more active or passive then the other, they being equally active and passive.

2. It is a contradiction to define a temperament to be the four qualities united into one harmony, and afterward to conceive one harmony to be two, that is, two temperaments.

IV. Properly and absolutely there is no distemperament, or *intemperies*, because the form of every mixt body is a temperament : Wherefore a distemperament sounds nothing else but a non-temperament, and consequently there is no distemper. I confess a mutation or change of the proportion of the Elements there may happen in a mixt body, yet notwithstanding that change the temperament remains a temperament. If then you intend by an *Intemperies* nothing but such a change, it may be defined to be the alteration of the form of a mixt being. *Alteration* is the intention or remission of one or more of the virtues, powers or forms of the Elements as they are tempered. *Intension* and *Remission* take in the senses formerly set down.

Although in a strict sense every intention or remission of a *first quality* in a mixt body changeth the *Form* of it, yet because that every change is not durable, but many are soon expelled again, through which a mixt body returns to its former form ; wherefore such changes are only counted substantial changes, or mutations, whereby a body is so much changed, that it is irreducible to its pristine *Form*, and whereby it produceth Accidents altogether sensibly differing from those, that were produced by its foregoing *Form* : for example, when the temperament of a man is so much subverted and

and changed by the appulse of another temperament, that it is rendered incapable of reduction to its former temperament or form, and the accidents produced by it are altogether sensibly differing from those that were produced by the foregoing temperament; as when a mans Heat is subverted by the appulse of Cold, so as he is deprived thereby of Life, Sense and Motion, then his form is changed into the form of a (*Cadaver*) dead Corps: because now other accidents are produced, being altogether sensibly different from the former, and the lost Accidents are irreducible. This is a substantial change or mutation, because the entire essence of the thing is changed.

V. An *Accidental change* or *Alteration* is, when the temperament of a body is so far changed, as that its Modes or Accidents appear to be sensibly changed, yet not totally, but partially, and when the change is gone no further then it is expulible, and the former temperament reducible. I said *sensibly changed*, because it is not every insensible increase or decrease of any of the first qualities of a mixt body, deserveth the name of *Alteration*, although in a large sense it doth. It will not be amiss to give you an Instance: A man when he is feaverish, is altered, because fire is intended more then it was in his precedent temperament, which therefore produceth a sensible burning, pains and weaknesses; but since his old temperament is reducible, it is only to be counted an Alteration, or Accidental Change. Another distinction between a substantial change, and an Alteration is, that a body by a substantial mutation is so much changed, as that you do not know it to be the same thing it was: but an altered body, although it is somewhat changed, yet it is not so much changed, but that you may know what it was.

If there be any *Infinicum* in the world, none is liker to be it then the number of temperaments; for there are as many temperaments possible, as there are Elementary Indivisibles, excepting four, to which one indivisible being added, changeth the temperament, and again another and another (and so on, until all the indivisibles be apposed) admitted to that changeth the temperament again and again.

CHAP. XIX.

Of the Division of Temperaments.

1. What an equal and unequal Temperament is. That there never was but one temperament ad pondus. That Adams Body was not tempered ad pondus. That neither Gold nor any Celestial bodies are tempered ad pondus.
2. That all Temperaments ad Justitiam are constantly in changing. That there are no two bodies in the world exactly agreeing to one another in temperature.
3. The Latitude of Temperaments. How the corruption of one body ever proves the generation of another.
4. That there is no such unequal temperament as is vulgarly imagined. That there is no equal temperament: is proved against the vulgar opinion. That where Forms are equal, their matters must also be equal.
5. What a Distemper is. What Galen intended by an unequal temperament.
6. Where a man may be termed temperate. What bodies are said to be intemperate.
7. The combination of the second Qualities of the Elements in a temperament. Their Effects.

An equal Temperament is divided into an equal temperament or a temperamentum ad pondus, or unequal, otherwise called by Philosophers a temperamentum ad justitiam.

An equal temperament is constituted out of an equal proportion of the forms of the Elements; and therefore it is called a temperamentum ad pondus, because it is so equally tempered, that if it were weighed, one Element would not over-balance the other. This Temperament consisteth of an Arithmetical proportion: It is otherwise called an anatick temperament.

An unequal temperament is, where the elementary forms are united in an unequal proportion. It is called temperamentum ad justitiam, because there is just such a proportion of the forms of the Elements as to fit it to act such an act, or to exercise such Offices.

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The proportion observable in this temperament is a *Geometrical proportion*, whereby one Element overtops the other, or is elevated above the other in such a degree or measure, as to produce such certain effects.

Nature never appeared in more than in one temperament *ad pondus*, but ever after in temperaments *ad justitiam*, as I have shewed a little before.

I have proved that the *Chaos* was the only temperament *ad pondus*, which its nature and end did require; thereby it was rendered capable of existing in a (*vacuum*) void space, and needed no external place to contain it, because it contained it self.

The body of *Adam* in his Innocency was not tempered *ad pondus*, because it would have rendered him immoveable; for the Elements being supposed to be in an equal proportion, and counterpoysing one another, local motion must have been impossible.

Celestial bodies, although of so long a duration, or Gold (what-ever Alchymists say to the contrary) are neither tempered *ad pondus*, because the one could then not be heavy, or the others light.

II. Since that a temperament *ad justitiam* ever obtaines one Element, or two, or three, predominating over the others, its force being greater then the others, doth by that means free it self daily from their detention; by which a temperament is constantly in changing, increasing in one, and decreasing in another quality: this experience tels us, *viz.* that every being after its first production in a sensible time undergoeth a sensible change of its Temperament, and consequently undergoeth an insensible change of temperature in an unsensible time, in such a manner that there is no body but doth at least change every minute of time in the detraction of a *Minimum*. Hence we are supplied with a reason, why there are not two bodies to be found exactly like unto one another in temperament, because bodies are alwaies a changing.

You may object, That many substances produce effects diametrically like to one another; *ergo* their temperament must be alike withal.

I deny the Antecedence; for although their Effects are alike according to their appearance to our senses, notwithstanding Reason perswades us, that there must be an insensible dissimilitude between their temperaments, and consequently between their Effects.

III. The degrees of Changes, or Latitude of Temperaments in bodies are these;

1. There is an insensible change or alteration, which our senses cannot discern; but it is only discoverable through Reason.

2. The second degree is a sensible alteration, which is evidently discernable by sense, in that its effects are sensibly different, yet they must not be so far deviated from the wonted preceding effects, as to be judged entirely unlike to them.

3. A total change and mutation of Form, to the reception of which the two forementioned alterations are previous dispositions. This degree of change in respect to the expulsion of the preceding form is taken for a *Corruption*; in regard of the subsequent form it is accounted a *Generation*. Hence derives this Maxime, *Generatio minus est corruptio alterius: & vice versa*. The *Generation* of one is the *corruption* of another. I cannot resemble the expulsion of a form out of a body, and a reception of another into the same subject, to a better example, then to a Ship in sight to one standing on the Pierhead at *Dover*, but out of sight to those that are at *Calice*, whither the Ship is bound; now the further this Ship sailes, the more it appears in sight to them at *Calice*; and the less to the others at *Dover*, until it is come quite into sight to them at *Calice*, and then it is quite gone out of sight from the others. Even so it is in *alteration*; for as the Ship fore-instanced groweth insensibly less, and recedes from one Coast to another; so an alteration likewise is insensible. But after a sensible time the ship appears sensibly less, and more remote, so after a sensible time an Alteration groweth sensible, and as the Ship at last after these insensible and sensible diminutions, and recesses, is suddenly quite gone out of sight and vanished, so a mixt body after all these insensible and sensible alterations is suddenly changed into another form and become another substance, the former being vanished.

The same is observeable in man, who altering insensibly every day in his temperament, draweth nearer and nearer to his Bed of rest, and after some years expiration, findes sensibly that he is altered in his temperament, both which alterations dispose him to his last sudden change and substantial mutation.

Galens delineation of the Latitude of temperaments doth tend to the confirmation of what I have proposed: *Lib. 1. de Temper.* he writes thus, If a quality is exuperant, it becomes an *Intemperies*;

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if it be yet more augmented, it turnes to a Disease; if it be most increased, it is Death, or a substantial mutation.

IV. A *Temperament* is vulgarly likewise divided into *equal*, or a temperament *ad pondus*; and *unequal*, or a temperament *ad justitiam*. They define an *equal* temperament to be that, which is equally and exquisitely tempered: and an *unequal* temperament to be that, which is unequally and iniquitely mixt. If this be their meaning of *equal* and *unequal*, then their division is illegal, because a temperament *ad justitiam* is as exquisitely and equally mixt as a temperament *ad pondus*: for Gold is tempered *ad justitiam*; but none will deny that Gold is equally tempered in particles, although not in great pieces. That it is equally tempered in Particles, its equal colour, equal consistence of body, equal weight, &c. do testifie. Can any assert otherwise, but that man is equally tempered in Particles? To the contrary, an unequal temperament is no temperament, or in the least tending to the generation of a mixt body, but to its corruption, as you shall read below.

Had they by an equal temperament implied an equal proportion of the Elements equally mixt, then their Definition would have been beyond controuling.

But give me leave to make somewhat a further disquisition upon their subtilities: Others state a twofold equal temperament.

1. When the elements concur in a mixt body in equal weights, and in equal mole and bigness: This temperament (say they) may be better faigned, and if it be found at any time, it doth not abide long, but passeth in a moment: their Reasons are,

1. Because a mixt body would rest in no place; for if it rested upon the earth, then the earth must predominate; if in the fire, then the fire must predominate, &c.

2. Neither could it be moved; for if it moved downwards, the heavy elements would prevail, if upwards, the light ones.

3. The most active quality would overcome & consume the others.

4. There can be no mixture unless some of the first qualities conquer, and others be conquered.

2. When the elements concur with equal force, but not with equal mole, which temperament may also be better conceived in our mind, then imagined to be real.

Those forementioned Arguments seem to disprove a possible real Temperament *ad pondus*, but how depravately, I shall instantly discover.

1. I affirm that a *Mixtum ad pondus* would rest in its own internal place, because it contains it self, neither doth it stand in need of an external place; for only *mixta ad justitiam* do necessarily require a place to rest in, because they having one element prevailing over the others, which moves them to the region of that element, whereof it self is a part, where being arrived, are contained by that entire elementary body; which is called a place, because it contains those bodies that are arrived to it.

2. Their second Argument only deducts a true inference from a true supposition; for doubtless a body tempered *ad pondus* could not be moved to an external place from any internal Principle, because none had so much prevalence over the other as to move it. And for what they assert concerning the not duration of a *mixtum ad pondus*, is erroneous; for an eval duration may be proved by their own words: thus, that which contains no contrary principle of motion in it self, is incorruptible, and consequently of an eval duration; but according to their own words, such a body cannot be moved; *ergo*.

3. This Argument is drawn from a false supposition; for in a *mixtum ad pondus* all qualities are equally active, wherefore it is incapable of dissolution or being overcome.

4. The last Argument is absolutely false.

As to the latter part of their Distinction, it is grounded upon a supposition not to be supposed, which is, that there should be a possibility of the equality of qualities or force in a mixt body, and not of quantities. I prove the contrary, *viz.* that where ever there is an equality of qualities, there must also be an equality of matter. Suppose that to balance one *minimum* of Earth, there needs a hundred times as many, or more *minima's* of fire, these hundred *minima's* if they were deprived of their lightness or form, and that one *minimum* of its gravity, the remaining matter of those hundred would be no more then the matter of this one: Look below; for according to the Philosopher himself it is the *forma quantitativa* that causes a *quantum* in Matter.

All temperaments in respect to the proportion of the ingreding Elements are equal: but all temperaments in respect to the manner of mixture are not equal. Wherefore according to the manner of *Mixture* a temperament is divisible into equal and unequal. An equal temperament there is, whose parts are equally mixt one with the other throughout their whole substance or subject: For example,

ple, Suppose the same as before, that 100 *minima's* of fire were a sufficient number to balance one *minimum* of earth, and that a thousand Centenaries or proportions of fire were to be mixt with a thousand *minima's* of earth, now to make this an equal temperament, there must between every hundredth *minim* of fire be interposed one *minim* of earth, and so throughout their whole subject. But supposing that in one particle of that substance there was admixt one *minim* of earth between a hundred, and in another Particle but one between two or three or four hundred, this would cause an unequal temperament.

An equal temperament is (*simpliciter*) called a temperament or temperature, and its intire being is called a *mistum temperatum*, or a temperate mixt body.

V. An unequal temperament is called an *Intemperies*, or distemper, because it is not equally tempered; Hence *Galen* writes, *Lib. 2. Aphor.* That an unequal temperature causes a difficulty. By an *unequal temperature* questionless he means an *Intemperies*, or Distemper. But the same *Galen*, *Lib. de Intemper. inequ.* towards the latter end, seems to acknowledge an *equalis Intemperies*, in these words: *But if all ones members are wholly (totapertota) altered and changed, they are immediately freed from their pain: they are then seated in a difficult state.* I distinguish an *Intemperies* into one, that is a beginning (*intemperies inchoata*) and another that is confirmed (*intemperies confirmata*;) or into a primar and secondary distemper; It is of a confirmed and secondary distemper that *Galen* speaks of here; but all beginning & primar distempers are unequal, neither is a confirmed distemper equally mixt, but only equally spread; for were it equally mixt, the body containing would be rendered more durable by it, as in Vinegar, where the hot adventitious parts first causing an *Intemperies* in wine, is afterwards equally mixt with its fixed spirits, through which its body is become more durable.

VI. A man is said to be temperate, whose temperament doth dispose him to perform his Actions and Functions perfectest. This temperament is not a *temperamentum ad pondus*; for through it he could not have been hot enough to have executed his natural or vital offices. Hence such a one is said to be *perfecte temperatus*, whose temperament *ad justitiam* is the perfectest; that is, executes its offices most perfectly. The heat of this temperament is a mild and gentle heat, or *calor blandus*. A Cholerick man is as properly said

to be tempered *ad justitiam*, but then his temper is comparatively less perfect, and his heat more sharp (*calor acris*.) Now when a perfectly tempered man is distempered, his heat is sharp, which in a Cholerick man is temperate, but that heat is unequally mixt with the qualities of the first temperate party, and equally in the latter; wherefore the same heat, which is counted temperate in one, is intemperate in another.

Fernelius, Lib. 3. Cap. 11. excepts well against the denominating a man to be of a cholerick or Melancholy temperament, because the heat or coldness, which Choler and Melancholy do produce, is unequally mixt with our temperatures, and therefore do not constitute a temperament, but an *intemperies*; wherefore it is more proper to state a man to be of a hot, cold, moist and dry temperament, or to deduct temperatures from the Elements, and denominate them according to their exuperancies, fiery, waterish, &c.

It is very proper to state the temperament of Ayr to be moist and hot, or cold and moist, &c. because its various situation disposes it to mixtion with fire and water for a moist and hot temperament; or cold and moist, if with more water and earth than fire, &c.

But *Aristotle* spoke very improperly, when he said, that the ayr was of a moist and hot temperature, when he supposed the ayr to be simple and unmixt. Now if it was unmixt, how could it be said to be tempered? for according to his own words, *temperamentum est plurimum*; a temperament consists of more than one.

The Division of temperaments is manifold,

1. There is a single temperament, wherein one Element re-bounds above the others, and thence according to its eminence, is called fiery, waterish, airy, or earthy: light with contiguity, light with continuity, heavy with contiguity, or heavy with continuity: rare, dense, thin or thick: hard, soft, &c.

2. A compounded temperament, when two Elements are eminent above the others in a temperament, as, fiery and waterish, fiery and airy, fiery and earthy, earthy and waterish, earthy and airy, airy and waterish.

3. When three exceed the restant one. According to which a Subject is said to be waterish fiery and earthy, earthy airy and waterish, fiery airy and waterish, fiery airy and earthy. In the same manner can a substance be named rare and dense, rare and thin, rare and thick, thick and thin, &c.

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The number of Distempers are agreeable to the number of Temperatures, which since they have been already enumerated, I shall not trouble you with the rehearsal of them.

The Temperatures and Distemperaments of the parts of mans body are much different to what Authors have described them, but their particular relation appertaining to another Treatise, I do wittingly omit their Insertion in this place.

A Temperament is further divisible into an *universal* and *particular* temperament.

An *universal* temperament is effected by the conforming of all the parts of an heterogeneous body into one temperament.

A particular temperament is the temperament of every particular part in a heterogeneous body; so a Bone is of a temperament differing from a Ligament, a Ligament from a Membrane, &c. But a Bone and a Ligament agree also in an universal temperament, *viz.* of the whole body.

A temperament is considered either absolutely in it self, or comparatively with another, as one *Species* with another, according to which the *Species* of man is most exactly tempered, as *Galen* hath it, *Lib. de opt. corp. constit.* above all other *Species*. This *ῥῆμα δ' ἡμεῶν* of man is the Rule whereby to measure the virtues of Medicaments, which if they do neither cool or heat, moisten or dry, they are accounted to be temperate, or *ῥῆματεα*. But if they alter it either in heat, coldness, &c. they are taken to be of a hot, cold, &c. temperament, or *ἄλογα*.

2. One Individual may be compared with another in temperature, whereby one man is said to be more or less temperate, hotter or colder than another.

3. An individual is compared to it self, and so a man is said to be more temperate in one age, time of year, Climate, &c. than in another.

4. When one part is compared to another, one is adjudged to be more temperate, hotter, moister, &c. than another: So *Galen, Lib. 1. de Temper.* towards the end, states the skin of a mans hand to be of an exquisite middle temperament between all sensible bodies, and the most temperate of all the parts of man.

Authors propose another Division of Temperament into

Rrr

actual

actual and potential; but since I have declared my Opinion in the Dispute of Powers, I shall pass it by.

VI. It will not be useless to adumbrate the Combination of the Second Qualities one with the other, and delineate their Effects.

Heat is either thin or dense. A thin heat doth attenuate and mollify; for molliaction is an action proceeding from a subtil attenuating heat, through which it attenuates the thick Moisture, and elevates the body of earth and water, whereby it is disposed to softness: Hence it is that the inward Crums of hard stale Bread are softened by loosening its moisture, and admitting the airy fire.

A dense heat is drying and burning.

A thick heat is obtuse, not penetrating, but dampish, like unto the heat of damp Hay.

Cold and thin is neither a powerful or piercing cold, but gentle and meek, like unto the cool quality of a Summers Brize.

Cold and dense is a piercing and potent cold, striking through the central parts of a body.

A thick and dense cold is condensing, congealing, and coagulating.

A dense thin Moisture doth moisten very much, because it penetrates through the pores of a body, and lodgeth it self there, whereas a single moisture is too thick to moisten or to penetrate.

A rare Moisture moistens less by far, and is soon expelled.

A thin Moisture moistens somewhat more than a rare moisture; But both do mollify.

CHAP. XX.

Of Alteration, Coction, Decoction, Generation, Putrefaction, and Corruption.

1. *What Coction and Putrefaction is. The Difference between Putrefaction and Corruption.*
2. *The Authors Definition of Alteration. The effects of Alteration.*
3. *The Division of Alteration.*
4. *That the first Qualities of the Peripateticks are not intended by the acquisition of new Qualities without Matter. Wherein Alteration differs from Mixtion or Temperament.*
5. *The Definition of Coction. Why a man was changed much more in his Youth then when come to Maturity.*
6. *The Constitution of women. Which are the best and worst Constitutions in men. That heat is not the sole cause of Coction.*
7. *The kinds of Coction. What Maturation, Elixation and Assation are.*
8. *What Decoction is, and the manner of it.*
9. *The Definition of Putrefaction.*
10. *What Generation imports in a large and strict acception. Whether the Seed of a Plant or Animal is essentially distinguished from a young Plant or new born Animal. That heat is not the sole Efficient in Generation.*
11. *Whether the innate heat is not indued with a power of converting adventitious heat into its own Nature. Whether the innate heat be Celestial or Elementary.*
12. *The Definition of Corruption. Why the innate heat becomes of more vigorous after violent Feavers. Whether Life may be prolonged to an equal duration. What the Catochization of a Flame is. By what means many pretend to prolong Life. That the Production of Life to an equal Duration is impossible. Whether our Dayes be determined.*

The Ambiguity of Corruption. Whether Corruption be possible in the Elements.

I. IN the precedent Chapter I have spoke at large concerning Temperaments in general, and their Divisions; to which ought to be annext the distinctions of Intemperatures.

*That is, an inequality of the elements in respect to parts or the whole, whereby the central parts are perused with more heat or spirits then the circumferential ones, but notwithstanding the mixture is equal in particles.

An Intemperature * moves either to an equal temperament and generation of a mixt body, or from a temperature to corruption and dissolution of a mixt body.

The former motion is called *Cottion*, the latter *Putrefaction*: the end of the former is an equal and durable temperament, and the generation of a mixt body; the end or rather *terminus ad quem* of the latter is a most unequal temperature (that is, when a mixt body returns to its first elements; now when its several ingredients are dissolved into their several elements, then they become most unequal, because every element in its own region superates the peregrine elements in three fourths, and yet there remains a temperature, because a fourth part of the alien elements is united to each of them) and corruption of a mixt body. The difference then between Putrefaction and Corruption is, that the one is a motion to dissolution, and the other is an entire dissolution it self. The same difference is observable between Cottion and the generation of a mixt body.

Alteration is a *Genus* to them all; for Cottion and putrefaction are Alterations in a lower degree; but Generation and Corruption are alterations in the highest degree.

II. Alteration is a motion of the Elements, through which, they move unto, into, through and from one another in a mixt body. The motion unto one another I have formerly called their mutual embracement, the manner of which you have read before. They move from one another accidentally and secondarily, after they have embraced one another so close, that the contiguous Elements break through the continuous ones.

I say Alteration is a motion; the same is attested by *Galen*, in his 7 *Tom.* of his works, fol. 14. 4. By motion understand a local motion: for the Elements change their places in alteration, and therefore a local motion. So that Alteration is a *Species* of local motion. Through this local motion the Elements do divide and penetrate one another, which Division through local motion doth fully comprehend the nature of Alteration.

Abra

Abra de Raconis in Dispnt. de Corp. mixt. sect. secund. asserts, that Alteration doth not terminate into qualities of the first *Spec. to wit*, *Habit* and *Disposition*, because neither of them are acquired by motion.

2. He states, That Alteration doth not extend to natural faculties and powers; because these are produced in an instant.

3. There is no Alteration concurrent to the production of figure and form: because these emanate from Matter.

To the contrary, Alteration constitutes Habits and Dispositions, Natural Faculties, Form and Figure; because all these are produced by the forms of the Elements acting through Alteration upon one another.

But to Answer to his Reason: I deny the first; for habits and dispositions are acquired through motion.

2. I dislike his second Reason also; for they are produced in many Instants.

3. Figure and Form are in or out of Matter, but not from Matter.

III. *Alteration* is either *successive* or *instantaneous*. It is called *successive*, because it is made up by many instantaneous alterations; like as successive time is said to be successive, because it is constituted out of many instantaneous times following one another; and nevertheless an instant is no less properly time then successive time; for time is nothing else, but the measure of one motion by another: Even so is an instantaneous alteration no less an alteration then a successive alteration, because a successive alteration is made up by many instantaneous ones.

An *Alteration* is called *instantaneous*, because it happens in the least time; which is called an *Instant*. Or an instantaneous alteration is the least alteration, whereby one Element altereth (that is, divides) the other in one *minimum*. Now since the beginning of action is from a *minim* or the least substance, the action it self must be also the least, which among the Elements specifieth an instantaneous alteration.

Alteration is to be termed *continuous*, when a continuous Element altereth a contiguous one; and *contignom*, when a contiguous Element altereth a continuous one.

IV. *Fr. Eustach. in Tratt. de Elem. Quest. II*: makes a query how the Elementary contrary qualities are intended and remitted through a successive alteration.

I. He

1. He states it for a truth, that Heat, Cold, &c. do acquire new qualities in their Subject.

2. That these new Qualities are entitative perfections, whereby heat, moisture, &c. are intended.

3. The doubt is now, how this entitative perfection is possible to any of these forementioned qualities: his Opinion is, that it is through addition of new degrees of heat, cold, &c. to the former degrees of the same quality, which are procreated out of the same Subject.

1. I deny that the forementioned qualities do acquire any other quality but what they are; mixe water with wine, and the mixture will have something of the qualities of water, and something of the wine, but no new quality that should be neither.

2. I reject his second Position as false.

3. It is erroneous that other degrees should be superadded out of the Subject; for if they are superadded, they are superadded either from the foregoing quality, or an extrinseck efficient; they cannot be superadded through themselves; for then a thing would be supposed to generate it self, which is absurd, because (*a seipso nihil fit*) nothing is made by it self.

They cannot be superadded by another, unless it be by the same qualities, by reason the cause must be of the same nature which the effect is of (*qualis causat talis effectus*) if by the same qualities, then the same again would generate it self; *ergo* they cannot be superadded, or if superadded from without, it is no new quality, but agreeing with that which is intended. Alteration is different from Mixture or a Temperament in general, because it is an action, which disposes and prepares the Elements & their Forms for mixture and temperature. The union of the Elements and Forms thus altered or disposed is a mixture and temperament. Wherefore Aristotle defines the nature of Mixture very well: Mixture is the union of Miscibles altered.

Authors usually divide alteration in *perfective* and *corruptive*, which are equivalent to *Cooktion* and *Putrefaction*.

V. *Cooktion* is an alteration tending to a temperament *ad justitiam*. Suppose at the first confusion of the Elements in order to a mixture and temperament, the fire and ayr to be unequally mixt with the others about the remote parts, but to be equally mixt with the central parts. Now *Cooktion* is nothing else but the promotion of the light Elements, which are yet latent about the Center, to an equal mixture (*secundum partes, sed non secundum totum*) with the heavy

ones;

ones; and although at present they are not so equally mixt *, yet through alteration, that is by dividing or embracing one another, the earth dividing the fire, the water the ayr, the fire again moving to the earth, and the ayr to the water, at last they become altogether entirely altered, embracing one another, which constitutes a temperament *ad justitiam*. They being all thus reduced to a temperament, the alteration is much abated, but still continues, although in a very small and insensible manner, which causes a stability for a while in the body so tempered: the reason of that great abatement of alteration is, because the Elements being now dispersed and divided into small parts, retain a less force, and exercise a less opposition one against another, and therefore the temperament becomes stable.

* That is, in the whole, yet in parts, or if not in parts, they are in particles.

Observe then that Coddion is swift, because of the greatness of alteration.

2. The temperament *ad justitiam* is stable, and *ad tempus quasi consistens*.

3. Putrefaction is the swiftest, because its alteration is the swiftest, as you shall read by and by.

Hence you may easily collect the reason, why a man in his youth alters or changes so much, and at his adult years is seated in a consistent temperament, and changes not for a long while, whereas a youth, we see, changes every day, or at least it is observable every Moneth; for stay away from a known youth but a Moneth, and when you see him again, you will mark that he is altered. This every Mother can spy out after she hath been gone forth from her Child but an hour or two, and at her return cry out, Oh how is my Child altered! The reason is, because the *calidum innatum* is copiously shut up within the central particles of each part, and therefore moves strongly by Alteration: Hence Authors conclude Infants to be perfused with a more copious *calidum innatum* than when they come to be grown up in years. The force of this (*ἡλικὸν ἐκπύρον*) promogenious heat is such, that it altereth Children almost every moment; Hence we may know why every external alteration of Diet, Weather, or Climate doth so easily injure them; because (besides that) they are much altered internally; wherefore the least alteration from without, if durable, soon disperseth and inflames their heat, and proves a frequent cause of so numerous deaths of Children, whereas men and women their heat being

being now consistent, and making but small force, their flesh closer, &c. are not so much subjected to Diseases, and such sudden deaths.

VI. Women die faster, that is, thicker then men, and are more disposed to sickness then they, because their innate heat and ayr do effect greater alterations upon their bodies, as having but little earth or compressing density, in comparison to men, to resist the light Elements, and moderate their irruptions; and therefore women seldom reach to any equal or consistent temperature, but are alwaies in changing, which in them after 18, 20, or 24 years expiration, is particularly called *breaking*, because then they alter so fast, that they swiftly put a period to their dayes; and that because their bodies being lax and porous, their innate heat shoots through in particles, and now in *minima's*, without which there can be no durable temperature. Were their bodies heavier and denser, the *minima's* of earth would divide their heat into *minima's*, and reduce it to a temperature. If then their innate heat doth constantly cohere in particles, and is never dirempted into *minima's*, it retaining in that case stronger force then otherwise it could do in *minima's*, it alters their bodies continually, and so they never attain to any consistency of age. Many sexagenarian Widowers or men of three-score years of age do alter less and slower then most women do from their five and thirtieth year; wherefore they do rather cover a wife of twenty, because she will just last as long in her Prime, or will be as fast in breaking, altering and changing her temperament, form and shape in one year, as the old man shall alter or change in three or four years; and so they grow deformed in an equal time. Wherefore a mans consistent age may last out the beauties of two or three women one after the other: and because of this, some in their mirth have proclaimed a woman after her 35th. year to be fitter for an Hospital, then to continue a Wife. No wonder if a Woman be more fierce, furious, and of a more rash swift Judgment then a man; for their spirits and heat moving in great troops and confluences of Particles, must needs move swift, which swiftnes of motion is the cause of their sudden rages, nimble tongues, and rash wits. To the contrary, a mans heat being tempered to *minima's*, moves more slow, & therefore is less passionate, and of a surer Judgment. A Cholerick man with a soft and glabrous skin, is likest to a woman in temperament, and is undoubtedly tied to all manner of Passion,

as Fear, Love, Anger, to Rashness of Opinion, forgetfulness, hazarding and foolish venturing, and at other times because of his Fear, is as obstinate and refractory in hazarding.

He is perfectly unfortunate, of a short life, and disposed to continual alterations, fitter for nothing then to fill up a Churchyard in a short space of time.

A man of a cholerick and melancholy temperature with a soft skin and somewhat rough, is likewise of a short life, but somewhat longer in his course then the former. His Fancy is contrived for plotting of base and inhumane designs, his Opinion is atheistical, his heart full of cheating and murderous thoughts, he is merciless and cruel to all, his nearest relations are as great a prey to him as strangers. Among men of this Temperature is a twofold difference, the one is more cholerick then melancholy, the other more melancholy then cholerick. The colour of the first is yellowish, of the last swarty. The former exceeds the latter by far in conditions, and is correctible, but with great pains, and notwithstanding is of a detestable nature; but as for the latter, his pravity is abominable, only fit to make a Hangman, or else is most likely to come to the Gallows himself.

The best temperature of all is a sanguine tempered with melancholy; this portends all honesty, modesty, faithfulness, pleasingness of humour, long life, great fortunes, pregnancy of wit, ingenuity, a rare fancy for new Inventions, tenacity of Memory, a sitting Judgment, profoundness of Meditations, couragious and generous; in fine, fit for all things. Wherefore it was a true Saying of *Arist.* that none could be wise, unless he was somewhat melancholy.

A pure sanguine temperature is of all humours the most pleasing, lovely, perfectly innocent, of a long life, and very fortunate. I could set down here demonstrable and certain Rules whereby to know infallibly the particular Inclinations, Passions and Faculties of every person, but apprehending that the Art might be abused by the Vulgar, and that the knowledge of it might prove as prejudicial to some, as profitable to others, I judge it more convenient to preserve its rarity and admirableness by secrecy.

Authors do successively attribute the causality of Coction to heat alone; but how erroneously you may now easily judge, since that I have explained the Elements to move each according to their proportion; as in Coction, Earth doth as much conduce to it through

its contiguous and punctual motion to the Center; as the fire doth in moving to the Circumference; wherefore the Elements are to be adjudged equal causes of Coction.

VII. Thus far we have spoken concernig *Coction* in general; and as it may be supposed applicable singly to the Elements: What remains, is to treat of the *Species* of *Coction*, depending upon the combination of the Elements, to wit, upon heat incrassated, heat condensed, water rarefied and attenuated, earth rarefied, &c. The *Objectum circa quod* of Coction is *Crudity*.

The *Species* of Coction are accounted to be three: *Maturation*, *Elixation* and *Affation*.

Maturation is a Coction performed by a thin and moderately condensed heat together with the co-action of the other Elements, whereby immaturity is overcome, and its subject perduced to maturity or a temperament *ad justitiam*. This kind of Coction takes place in man, who in his younger years is said to be immature, and by process of time to be perduced or come to maturity. All animals are perduced to their consistent Coction by Maturation.

Maturation takes its beginning from the Center; whence it is that the innermost flesh of Beasts is the sweetest, because it is the first, soonest and best concocted.

Maturation renders a mixt body more compact and solid then it was; because it consumes and expels the airy & waterish parts, which being diminished, the remainder is left more solid and compact.

Through Maturation a body becomes sweeter, as we may observe in all fruits growing sweeter through Maturation, whereas they before were acerbous and austere.

A body through Maturation is exalted to a greater purity.

Elixation is a coction performed by a rarefied and attenuated moisture, that is an airy and fiery water, and the co-action of the other Elements. Thus the equality of temperament in Fishes, and other waterish bodies proceeds from Elixation.

Through this thin and rare moisture all the parts of a mixt body are equally laid, and through its fluor thick parts are attenuated, dense ones diducted, and rare ones condensed.

Affation is a Coction effected from a dense heat acting socially with a just proportion of the other Elements. Thus hung Beef, and dried Neats Tongues are concocted. All Metals are likewise concocted or purified by Affation.

I shall

I shall not spend more words to shew the manner of the variety of *Cottion*, since it is apparent by what hath been said before.

VIII. A *Decottion* is an equal wasting of a concocted body, hapning through the continuation of a concocting alteration. Or otherwise it is an overdoing or an overcottion of a mixt body, through which it must necessarily be wasted, which notwithstanding remains the same thing, or according to *Aristotle*, *remanet idem Subiectum sensibile*. But in putrefaction a body doth not only wast, but makes way also for a Dissolution, and the subject is sensibly changed.

2. *Putrefaction* derives from an unequal alteration, caused by an immoderate and unequal adjunction of an extrinsick, influent or adventitious quality to the least parts of one or more of the Elements.

But *Decottion* is equal, and performed by the same causes that *Cottion* was.

Or in a word, the one is a violent and sudden motion to dissolution of the parts of a mixt body into their first Elements; the other is a gradual, successive, slow, durable, prolonged, and natural dissolution of a mixt body into its Elements.

As for the manner of *Decottion*, it is thus. You must conceive that in *Cottion* the innate heat or whole temperament suffereth but little loss or dislocation, because at the formation of any body, the heat is so arctly joyned to the central parts, that although it is attenuated through the Ayr, yet firmly adhering to *minima's* of earth, and surrounded with *minima's* of water, it cannot be entirely loosened from its adherents, before it is minutely divided and spread equally through all the body.

2. The Minutes of weighty Elements arctly compassing the fire, do detain the same fire from exhaling.

3. When the *Cottion* is perducted to its height, and the Elements are equally laid, their forcible alteration ceaseth, but nevertheless a smal alteration doth still continue, every *minim* yet pressing against the other, whereby the superficial heat doth by little and little exhale, * whose vacuity the nearer light parts do succeed to fill up, and afterwards those of the central parts next following. When now the heat is so much disperfed & expelled, that it is grown invalid to balance the other Elements, it is suddenly suppressed in an instant; after which instantaneous suppression, another form suc-

* Or rather is expressed by the overpowering gravity of the weighty elements, as you may read below in the Chap. of *Vacuum*.

ceeds at the same nick of time, and verifieth that *Maxime: quod Substantia generetur in instanti*, that a Substance is generated in a moment.

The reason, why a form is so suddenly and in the least time expelled, and another received, is, because when the heavy superficial parts, and those next to them are freed from their light elements, they move all together with one force, which force falling suddenly and violently upon that small part of the remainder of the light Elements, doth then violently and suddenly chase and expell them.

By this it appears that *Decoction* is natural, because it is from an intrinsic Principle.

IX. *Putrefaction* is a violent alteration of the Elements in a mixt body from too great an irruption of an extrinick elementary quality, which joyning with its like, overpowers the *mixtum*, and frees that Element from its nearest alligation to the minimal parts of the other Elements, and so do both easily overcome the mixture. Wherefore the cause of *Putrefaction* is an unequal temperature or distemper effected by the superaddition of an extrinick elementary quality. The Causes in particular are four:

1. When the intrinsic earth is impowered by the adjunction of external pressing terrene *minims*, which overpressing the innate heat, and dividing it from the Ayr, first extinguisheth its flame, and then presseth it out from its body. This *Species* of *Putrefaction* may be called a tendency to *petrification* and *terrification*. I will give you an Example: A man who is frozen to death is properly said to have been putrified by a tendency to *Terrefaction*: for the external frosty *Minims* pressing hard upon him together with the intrinsic earth of his body, do at last extinguish his vital flame.

2^{ly} and 3^{ly}, when external Moisture is adunited to the internal Moisture, it doth also cause a putrefaction of that *Mixtum*, through over-relaxing and opening the body, whereby the light parts easily procure a vent *. This may be otherwise signified by a tendency to moulding. Those small filaments that do usually adhere to the surface of a moulded body, are nothing else but a diduction of the circumjacent Moisture into length and tenuity by the egress of Fire and Ayr. The Greenness or Grayishness of the said filaments is nothing but the fire splending and glittering against the circumjacent Moisture, the refraction and reflection of which (arising from

* Or rather are the easier expelled by the down pressing earth.

from the proportion of Crassitude or Tenuity of the body reflecting) causes a greenish light; and if it be more transparent, the splendor appears grayish.

4. When fire is intended by addition of new degrees of external fire, and so moves more forcibly towards the Circumference*; its name may aptly be implied by a tendency to *Combustion*.

I have formerly asserted that Coction was a tendency to Generation, wherefore Order and Method require from me at present, that I should illustrate the Nature of *Generation* and *Corruption*, both which in a strict sense are the *termini ad quem* and end of *Coction* and *Purification*.

X. Generation in a large sense imports the constitution or Production of a mixt being; but since that all generated beings are in a continual motion, it is strictly attributed to the middle term, or a term of reflection, as I may call it, where the exceeding quality doth augment its force, afterwards insensibly and sensibly decreasing.

Notwithstanding a mixt body at its first production is an entire mixt body, although it is not yet arrived to its full extension of parts: An Infant is as much a man as a Giant, or is as perfect a mixt body consisting of matter and form as the same Giant. Here I fall into a doubt, whether the seed of a Plant or Animal is essentially distinct from a young Sprig or Plant, or a new-born Animal. Is there any more difference between a Seed and its germined body, then between an Infant and a man? What is a man but an Infant, thrust out into length, breadth, and depth? And so what is a young Plant but its seed protruded into all dimensions? We say an Infant is a man, because it bears all the Figures and Shape, and acts rudely the same actions which a man doth. Doth not the Seed within its Pellicle bear all the marks, shape, figures, and exerciseth the same actions rudely that a Plant doth? Doth it not attract, retain, concoct and expel in the same manner as a Plant? Is there any substance or new quality advened to it, and essentially joyned to its *Minims*? To this Opinion I find Hipp. Lib. de Diet. Galen, Lib. 1. de Sem. Cap. 7. Argenter. Lib. de art. par. tit. de Temper. Zabarel, de anim. fac. ult. Cap. 11. Picolthomin. Lib. 1. Praelect. Anat. 1. Præf. Foubert. Licet, and many others consenting. You have this Controversie discussed more at large by that painful Collector of Collections, Sennert. in his *Hypom. Phys.*

Authors assert strongly, that nothing can be computed to the number

* Hereby the earthy & waterish parts are divided from the light ones and cast aside; hence it is that we spy such a clodding together of waterish & earthy particles, and their separation from the light humours in blood drawn from a feaverish patient.

number of Efficient of generation, unless it be hot, where if they do not find a particular hot Efficient, they accure to an universal one, the Suns efficiency, or other Astral Influences. Pray, let them answer me, By what Efficient many mixt bodies, as plants, Bears and others are generated in the Winter in *Greenland*? which that they are, is undoubted to many; but supposing them to be generated in the Summer, which is colder then our coldest winter, they cannot comprehend the Suns heat for an extrinick Efficient, because the cold doth by far exceed the heat in those Countries, as appears by the great Islands of Ice; wherefore the efficiency is rather to be imputed to an acute cold, which through its acute weight doth divide and spread the included heat into the parts. I do not deny but that there is an admitted Efficient in the juyce and food which they do suck in and ingest into their bodies, which here, as in all other conditions, stirs up and diducts the innate heat, and being adunited to it, strengthens and augments the same: But I pass by this to what is more plain. Ice and many bodies generated thereon, as stones, &c. are mixt bodies, and is it the heat of the Sun that doth effect these? Ergo Cold with the other qualities are equally to be stated Efficient.

XI. Before I take my leave of this Subject, I must discuss one Controversie more, whether the innate heat be not indued with a power of changing extrinick heat being admitted within the quantity of the containing body into its own nature, and to convert it into innate heat. On the one side we might judge it impossible that so little heat, as is contained within the Seed of a Vegetable should be sufficient to perduce a Tree to that great bigness which many are of, and continue so for many years. On the other side, Authors do unanimously conclude, that the innate heat is destitute of such a virtue, and that the heat advened to it is an influent and admitted heat essentially differing from it, the one being of a celestial origin, the other of an elementary. *Arist. Lib. 2. de Gener. Animal. Cap. 3.* declares his Judgment upon this matter: πάντων μὲν γὰρ ἐν τῷ σπέρματι ἔνυπάρχει ὅπως ποιεῖ γόνιμα εἶναι τὰ σπέρματα, τὸ καλούμενον θερμὸν. Τύττω δὲ οὐ πῦρ, ἔστι τοιαύτη δύναμις ὅταν, ἀλλὰ τὸ ἔμπει λαμβανόμενον ἐν τῷ σπέρματι καὶ ἐν ἀρρῶσει πνέμα, καὶ ἐν τῷ πνέματι: φύσις ἀναλογος ὅτι τῷ τῶν ἄστρον στοιχείῳ. For in the Seed of all things there is that contained which makes them to be fruitful, to wit, that which we call heat. Neither is it fire, nor any such faculty, but a Spirit, which is contained in
the

the Seed and in the spumous body, and the nature, which in the spirit is respondent to the Element of the Stars: And a little further he repeats his mind; ὅτι μὲν ἐν τῇ τῷ ζῷοις θερμότητι ὅτι ἢ ὅτι ἐν τῷ πνεύματι ὅτι τῷ ἀπὸ πυρὸς φανερόν. It is evident that the heat in Animals is neither fire, nor anything arising from fire. If then it is according to the mind of *Arist.* to state the innate heat to be Astral, and the influent heat to be elementary, there must intercede a quidditative difference between them, and consequently being of so distant natures, the one cannot beget the other.

Before I conclude, it will not be amiss to enquire what they intend by (ἐμφυτον θερμότητα) *Innate heat*. *Galen, Lib. advers. Ly.* writes, that the innate heat is a body, whence most Authors make a distinction between θερμότης, *caliditas*, heat, and θερμὸν ὅτι; the former importing a nude quality, the latter a body. This body is constituted out of a primogeneous (ἀρχαγενὸν ἀπὸ τοῦ ζῶοντος) Moisture, Celestial heat, and insited Spirits, according to which *Fernel. Lib. 4. Physiol. Cap. 6.* sets down this definition; *Innate heat* (calidum innatum) is the primogeneous moisture perfused throughout all parts with an insited spirit and heat. But why ought this mixture not rather to be denominated a primogeneous moisture from the substance, then innate heat from the quality, since that a substance is counted to be more noble than an Accident?

2. What difference is there between an insited spirit and innate heat? Certainly none; a spirit consisting of heat and moisture, and so doth the other: Or if you make a difference between them, you are like to fall into an error; for if a spirit be a compleat substance, as all Philosophers do grant, and that be united to another substance, namely a primogeneous Moisture, they must constitute a Totum per Accidens, but none will assert the innate heat to be a totum per Accidens; Ergo.

3. I find a variance among them in these words, σὺμφυτον, *connate*, and ἐμφυτον, *innate*; some taking them for one, others limiting σὺμφυτον to heat, that is only proper to living creatures, and applying ἐμφυτον to heat, that is common to all mixt bodies, and is subjected to Putrefaction, as if connate heat were not subjected to Putrefaction as well as the innate: Doth not the connate heat of man suffer putrefaction in a Hectick Fever? You may further read of a fourfold difference of innate heat in *Argentor.* his Treatise of the innate heat.

1. I conclude that the connate heat is elementary, and not astral. I prove it. There was connate heat before the Stars were created; *ergo* its Original was not thence. The Antecedence is plain from Scripture, *Gen. 1.* for there it appeares, that Herbs, which questionless were actuated by connate heat, were created the third day; whereas the Stars were not created before the fourth day. 2. Where the effects and operations are alike, there the causes cannot be unlike; but the effects and operations of Astral heat are no others then of Elementary; *ergo* although I granted it to be Astral, it must also be elementary.

2. Innate heat is said to be a spirit, because its rarest substance is adunited to the least bodies of the other Elements, whereby it is fortified, and becomes more potent, and is constituted a most subtil moveable body. The purest and most potent spirits are about the Center; they next to them are not so subtil; others yet more remote are grosser.

3. The connate heat hath a power of converting influent heat into the same nature it self is of. I prove it. *Hippocrates* teacheth, that the maternal blood and the sperm are perfused with innate heat; if then advenient blood can be united to primogeneal blood, *ergo* influent heat may be united to the innate heat, and converted into the same nature. 2. Flesh contains a part of connate heat in it, but cut off a piece of flesh, and Nature will restore it again; if restore it again, then innate heat must be restored with it: if so, then this innate heat must be generated out of the blood by the innate heat of the next adjacent parts.

4. Childrens teeth are regenerable, but teeth contain innate heat in them; *ergo* innate heat is regenerable.

5. That, which the fore-quoted Opinion stated a putrefactible innate heat is a volatick and moveable heat, which not being subtil enough to be united to the fixt or connate heat, is protruded to the external parts, and is subjected to putrefaction; so that in the body of man the food that is daily ingested, its subtilest part serveth to be converted into innate heat, and to be substituted into the room of the last consumed innate heat. The courser parts are converted into moving and external heats: By Heats *Calida* understand hot Particles.

6. How is it possible, that so little innate heat, as is contained within a Dram or two of Sperm should be sufficient to heat the body of a big man?

XII. Corruption

XII. *Corruption* is the dissolution of a mixt body into the Elements, or into other bodies more resembling the elements then it. The Cause of *Corruption*, as I said before, is the greatest putrid alteration, whereby the innate heat is violently dissolved. In Putrefaction the moving heat alone is altered, which is reducible; but if it continues to a great putrefaction, then the innate heat suffers danger, and is yet likewise reducible; but if the greatest putrefaction seizeth upon a body, then the innate heat is strongly putrified, and is rendered irreducible, because through it the greatest part of the innate heat is corrupted, which to expel, the remaining innate heat finds it self too impotent. But if only a less part be corrupted, and the greater abide in power, it may overcome the other, and reduce it self. Hence a reason may be given, why many men having been oft seized upon by Feavers, yet have been cured, and their innate heat is become more vigorous then ever it was, yea some live the longer for it. The reason is, because in most curable Feavers, the moving spirits alone are affected; neither doth the Alteration reach so deep as greatly to disturb the innate heat, but oft times the body being foul, and the bloud altered by peregrine humours, the body is cleansed, and by its fermenting and expelling heat the bloud is freed from these noxious humours, after which the primogenious heat is less oppressed, and acts more naturally then before, through which life is prolonged. Here we may answer fundamentally to that so frequently ventilared doubt, whether life may be prolonged to an eval duration? *Paracelsus* and many of his Sectators do maintain it affirmatively, to whom three hundred years seemed but a slight and short age, and in stead of it promising a Life of *Nesfor* to those as would make use of his (*Arcana*) Myste-rious Medicines, yea a life to endure to the Resurrection. But these are but Fables and Flashes; for since that a man is unequally mixt, and that one Element doth overtop the other, questionless the predominant element will prove a necessary cause of the dissolution of that *Mixtum*; but was a man tempered (*ad pondus*) equally, and as *Galen* hath it, *tota per tota*, his Nature would become eval, all the Elements being in him composd to an equal strength in an equal proportion. If then otherwise the radical heat and moysture do sensibly diminish, certainly old age or gray haire cannot be prevented. Possibly you may imagine a Medicine, the which having a vertue of retarding the motion of the vital heat must of ne-cessity

cessary prolong its life in the same manner, as I have read in some Author, I cannot call to mind which, a Candle hath been preserved burning for many years without the adding of Moisture to it, by being placed in a close and cold Cave deep under ground. Here (if true) a flame was retarded in its motion by the constringent cold of the earth, and thereby the Tallow was saved by being but a very little dissipated through the motion of the fire. I say then, could the natural heat be retarded by such a constrictive medicine, as to catochizate it, and hinder its motion, life might be protracted to some hundreds of yeares: But again, then a man could not be suffered to eat or drink in that case, because that must necessarily stirre up the heat, which excited, if it were not then ventilated by the subtracting the forementioned constrictive Medicine, whereby it might dissipate the acceding moisture, must incur into danger of extinction. But this prolongation of life pretended by *Theophrast. Par.* is attempted by hot Medicines, such as they say do comfort and restore the natural Balsom of man, which is so far from retarding old Age, that it rather doth accelerate it; for if the heat is augmented, then certainly it must acquire a stronger force, whereby it procures a swifter declination, as hath been shewed. Besides, Experience confirms this to us: Many having accustomed themselves to take a Dram or two of the Bottle every Morning, viz of *Aq. vit. Mart.* hoping thereby to fortifie their heat, and so to prolong their years, have by that means enflamed their heat, & soon kindled it up to a corruptive fire: & to this purpose, I remember a notable Instance, which some 9 or 10 years ago I observed at *Leyden*, where visiting the Hospital weekly with the publick Professor of Physick, I took notice of a Patient, being a man of about 40, his Temperature cholerick, his habit of body thin and rough, his skin changed to a brownish tawny, and full of wrinkles; his complaint was only of an universal faintness when he went; his Urine was overcoated; enquiry being made into the Constitution of every particular part, they were found to be like affected with an *Atonia calida*, or Intemperature towards heat: a further search was made into the cause of so universal a heat; his Diet and Course of Life had been very moderate, only he confessed that by advice of a Physician he had accustomed himself to take half an Ounce of *Aq. vit. Mart.* every morning for 6 years together: Here the cause was found out, namely, the over-comforting and augmenting of his vital flame, which was

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now become so potent, that it had penetrated all the body, and was ready to diminish and decrease every day, whence through its dayly progress it had wrought such strange effects in this man, that he although but young, appeared to be as old as a man of 70. Even almost such another Patient I saw in the *Charité* Hospital at *Paris*.

Wherefore it is evident, that by such means life is not prolonged but shortened: neither will the *Oximet Squillit.* of *Galen*, so much commended by him to keep back old Age, do any more then the forenamed *Aq. vit.*

1. I conclude then that old Age may be retarded, and Life prolonged, but by other means, then ever hath been detected hitherto by any man; however *Lactantius* writes, that *Adam* used a most excellent and admirable Magistery in his Family, through which their years were much prolonged. Many describe the length of life of the Patriarchs to the same mysterious Medicine, which was successively discovered to them by *Adam*. I have read of *Artephius*, and others in the daies of old, who are said to have protracted their daies to a thousand years by help of Art, and means of using the Tincture of Gold, and sometimes the Tincture of Steel.

I have also read of a Maid, who had lived for many years without eating or drinking, she was not any thing sensibly altered in all that time, but lay constantly a bed, or moved seldom, unless it were to turn her. As I think, you may find the Relation of it in *Schenckius* his *Observ.* Here you have a plain Retardation of Age by a *Catochization* of heat and the other qualities: for she being Phlegmatick, her radical Moisture was thereby incrassated, which incrassation kept her innate heat in the same flame for a long time, until that it was loosened by procatartick Causes. I shall speak more at large concerning the *Catochization* of fire in its flame below.

Through the same *Catochization* of the Elementary qualities other inanimated bodies were likewise preserved and retarded in their Alteration, insomuch that the bodies so *catochized* have not undergone the least sensible Alteration or change in hundreds of yeares. The *Egyptians* had a way of preserving dead bodies three thousand yeares, as we read concerning their *Mummies*, in such a manner that the Corps could not suffer any sensible change in an Age, or otherwise how could they have lasted so long? The search into their manner of Embalming leads us unto the knowledge of

such a durability. They dipped close woven Linnen into a melted mixture of Gums, Rozins, Wax and Spices, in which they wrapped the Corps, rowling it sundry times close about, which afterwards they put into a thick Leaden Coffin, & shut it up in another Oaken Coffin, and placed the same in a deep, cold and dry Celler or Cave, being closely environed with dry Sand and Marble Stones. All which caused a greater condensation of the earthy parts, incrassation of the Moisture, and seisure upon the fiery and airy parts, and a detention of the said parts in the same situation as they were seized upon: or it may be, they were a little more divided, whereby their force was somewhat clipped and stopped in their motion; however there remained so much force as to keep the fire safe from being violently expelled by the weighty Elements; in such a manner that there passed no opposition between them, but they were seized upon, and so detained as a man is in a *Catoche*, upon which ground I call it a *Catochization*. Did there pass any remarkable action between them, then the light parts must acquire a vent, whereby the body must necessarily change and approximate to a dissolution.

2. The greater incrassation of Moisture doth keep in the heat, and indurates the body; for were it thin, it would mollifie and open the body, and give occasion to the egress of the intrinick heat.

3. The shrowding of the Corps in many Folds of Gummed Linnen, doth hinder the ayr from penetrating to it, which if it did, it would soften the body, and make way for the effuge of the light parts.

4. The Spices consolidating the body through their drying faculty, conduce to the detention of the heat.

5. The Coldness and Dryness of the place, and of the Coffins do contribute to the same action, and preclude the way to the ingredient Ayr.

All other inanimate solid bodies are preserved and prolonged in their duration by detaining them in Quicksilver, Snow, Wax, shining Amber, Honey, Syrrups, Gummes, Oyles, wet and dry Sand.

As for a burning Flame, it cannot be so rigidly detained as to have its Smoke totally kept in, which reverberating upon the heat, and joyning with the other weighty Elements, would violently expel the heat: but as I said before, the detention by condensation
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and incrassation must be no more, then that the smoak may pass; yet in small flames this is not so much necessary.

There is another means, whereby to prolong life by keeping the heat in a flame, and is performed through averting the heavy Elements, and attenuating and lightning them by Art; for otherwise they would violently extinguish the flame. Wherefore by the combination of these two means, namely *Catechization* and *aversion* by way of detention, there may be an infallible Medecine compiled for the prolongation of life, and retardation of old Age. But of this more particularly in my Principles of Physick.

2. *Concl.* Production of life to an evel duration is impossible. Were it that the necessity of mans dissolution was independent upon an improporionate temperament of the Elements, yet Gods Decree and Judgment would necessarily bring it upon him, *Gen. 2. 17.* *But of the Tree of the Knowledge of good and evil, thou shalt not eat of it; for in the day that thou eatest thereof thou shalt surely die.* Job in the 17th. Chap. declares the necessity and certainty of mans death, particularly in v. 5. *Seeing his dayes are determined, the number of his Moneths are with thee, thou hast appointed his bounds that he cannot pass.* I cannot here omit the detecting of that dull vulgar Errour and Doubt arising about these very words of Job. Their way of Argumentation is, If the life of man is determined to a year, a Moneth, Day and Minute; *ergo* it will prove in vain for me to have that care of my health, and caution of hazarding my Life at Sea or at Land: In fine, there is neither Anticipation or Posticipation of Life. Man acts voluntarily, that is freely, without any necessary or fatal impulse; wherefore one who is drowned at Sea, was not compelled to go and be drowned, but went thither freely, or might have stayed away; if then he might have stayed away, *ergo* his life might have been prolonged by staying away. Or otherwise, suppose a man is diseased with a *Gangreen* in some one extreme part of his body: Cannot we say that this man, if he lists, may have his life prolonged by amputating the gangrenous Member, or if he will, that he may accelerate his death in suffering it to increase and creep on? But to Answer to the Text. Determination of Dayes is twofold.

1. Of the Natural Course of mans Life: as, suppose that the Temperament of man will last and endure (if it run off in a Natural Course) to a hundred and twenty yeares, some more, some less;
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now this term may be said to be Gods Determination of the Dayes of man, when he hath determined that his temperament shall endure no longer then he hath made it to endure naturally.

2. There is a Determination of life before it hath run out his natural course, as when God doth manifestly cut down a man in the full strength of his years. Again there is an ordinary determination of the duration of beings, by which God hath determined, that all things shall have their natural course of being, acting and continuing. Were it not for this ordinary determination of God, he would never suffer the wicked to live, or that any Natural thing should be serviceable to them.

2. There is also an extraordinary Determination, through which God hath determined to act beyond his ordinary determination in, through, or upon things, which are ordinarily determined. This determination is secret, and called Gods hidden will. Neither doth his extraordinary determination contradict, or clip, or change his ordinary determination, but that God may or doth sometimes determine beyond it. This premittid,

I do assert, that the determination of mans dayes in the Text, is to be understood of Gods ordinary determination of the Natural Course of mans Life. I confess although God according to his ordinary determination hath determined the Natural course of mans dayes, yet he may through his extraordinary determination prolongate the same mans life to many years, and notwithstanding thereby he doth not contradict his ordinary determination; for a man having run out his full Natural course of life, hath therein answered Gods ordinary determination, which being expired, God may, and sometimes doth supernaturally and by his extraordinary determination superadd other natural Principles, through which his life is prolonged; thus was the life of King *Hezekiah* prolonged by God superadding new Principles of life, whereby his life was protracted 15 years longer; for through Gods ordinary determination he must have died fifteen years before; because all his natural heat was spent through his Disease, and his temperament run off: Wherefore, as the Text saith, 2 *Kings* 20.1. he must have died of a necessity; but God extraordinarily superadding a new heat, and a new life prolonged his dayes.

In the same manner doth God oft-times through his extraordinary determination cut down the wicked, and shorten their dayes,
Psal.

Pfal. 55. Look back to the 9 and 10 Chap. of my *Natur. Theol.*

Here may be demanded, how *Adam* and *Eves* Bodies could have been of an eval duration, supposing they had remained in their Innocency, their bodies being tempered *ad justitiam* only, and not *ad pondus*. I Answer, That (according to all probability) their primogenial temperature was by far more perfect (*comparativè*) then ours, and therefore did not consume faster then their Natures could adunite other parts in the room of the dissipated ones; besides that heat which was dissipated, was only part of the moveable heat; as for their fixt heat, that was so arctly united and tempered, that its nexè was indissoluble, which through their Fall is become soluble.

This Controversie is stated and handled more at large by *Beverov. vit. Lib. de vit. term.* and *Gregor. Horst. Lib. 2. de Nat. human. Exerc. 4. Quest. 10 & 11.* whom you may peruse at your leisure.

As *Generation* did import a twofold signification, so doth *Corruption*.

1. In a large sense, it implies a natural dissolution together with the declining alteration thereunto tending.

2. Strictly it signifies a violent dissolution of a mixt body through a preceding *Putrefaction*. Hence those may be advertised, who do erroneously confound *Putrefaction* and *Corruption*, taking them for one.

Its *Species* are *Combustion*, *Petrification*, *Corruption* by waterish moysture, and *Corruption* through ayry moysture. You may easily understand the natures of them by what hath been spoken before.

Whether *Corruption* is possible to the Elements, as they are now consisting mutually mixt one with the other, is a Doubt moved by some. I Answer, that a total *Corruption* is impossible, a partial one happens every hour; for we see ayry bodies, as Clouds, dissolved every day: the like happens in the Region of Fire, where fiery bodies are dissolved every day, and others again generated. In the Earth and Water some bodies are likewise corrupted, and others generated every day; so Gold, Silver, and all other hard Metals, are sometimes violently corrupted under the earth, from an extrinseck potent and purrifying heat.

CHAP. XXI.

Of Light.

1. *What Light is. The manner of the production of a Flame.*
2. *The Properties and Effects of Light.*
3. *That Light is an Effect or consequent of a Flame. Whence it happens that our Eyes strike fire when we hit our Foreheads against any hard Body. That Light is not a quality of fire alone. That Light is not fire rarefied. That where there is Light, there is not alwaies heat near to it. How Virginals and Organs are made to play by themselves.*
4. *That Light is a continuous obduction of the Air. That Light is diffused to a far extent in an instant, and how. Why the whole tract of Air is not enlightned at once.*
5. *The manner of the Lights working upon the Eye-sight. That sight is actuated by reception, and not by emission.*
6. *The reason of the difference between the extent of illumination and calefaction. That Light cannot be precipitated.*
7. *That Light is not the mediate cause of all the Effects produced by the Stars. That Light hath only a power of acting immediately and perse upon the optick spirits. How the Air happens to burst through a sudden great light. That a sudden great Light may blind, kill, or cast a man into an Apoplexy.*
8. *How Light renders all Objects visible. Why a piece of Money cast into a Basin filled with water appears bigger than it is. The causes of apparent Colours. Why a great Object appears but small to one afar off. The difference between lux and lumen. What a Beam is. What a Splendour is. That the Lights begot by the Stars, and other flames are not distinguished specie. How the Cælum Empyreum is said to be Lucid.*

I. **W**E are now to ennumerate and unfold the remaining qualities risen from the mixture of the Elements; such are *Light, Colours, Sounds, Odors, and Savors.*

We first begin with Light, as being the excellentest among them.

Light

Light is a quality emanating from flaming fire. A *flame* is nothing else but incrassated Air expanded and deducted in rotundity by condensed fire, which is detained and imprisoned within the fore-said qualified Air. The difficulties requiring illustration are, 1. How the fire comes to be condensed. 2. How imprisoned. 3. Why the Air doth immediately surround it. 4. How light is propagated, and the manner of its action.

As to the first: Fire I have told you will not burn unless it be condensed; for being naturally rare, it penetrates through the incrassated Air with ease: but being condensed it doth not, because it is adjoynd to a heavy gross body (namely, the *minima's* of the Earth and Water) which doth put a stop to its pass; but nevertheless the force of fire is stronger by reason of those adjoynd heavy *minima's*: For fire being violently detained by them is grown stronger. 2. Fire being to divide another thick body makes use of the compressing accuteness of Earth to divide it, which it effects by protruding those dense parts before it; for through its single rarity it could not.

2. Fire flying out and being expelled out of a mixt body, if it doth not meet with incrassated Air to retain it, will pass and vanish; but hitting against incrassated Air it strives to pass; the Air again being continuous doth maintain her continuity with all her force; and thirdly, the fire moving circularly makes a circular dent into the mass of the said thickned Ayr, which it beats against, the advenient Ayr also striving from all parts to recover its situation, and therefore necessarily surrounding the fire. The Ayr again is also become stronger, because of its violent detention, notwithstanding the fire being the more potent doth deduct it into an oval or round Figure, in the same manner as Wind striving to pass the water doth blow it up into a bubble. Fire being thus condensed, imprisoned, and surrounded with thick ayr, and deducting the same ayr into an oval or round Figure is called a flame.

II. The properties of a flame are 1. to be burning hot, 2. to be an (*lux illuminans*) illuminating light. The burning proceeds from the particles of condensed fire violently striking through the moisture of a mixt body, whereby it divides it into ashes, or a black crust tending to ashes. Before I shew the manner of emanation of Light, let us first examine, what it is we call Light *. *Light* is that which is visible, and renders all things about it visible. Wherefore

*By taking
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you do mark, that Light is nothing but that, which affects and moves the eye-sight. If then I make it appear to you, whereby it is that fire doth affect the Eye-sight, therein I shew you the manner of emanation or operation of Light. You must apprehend the optick spirits to be a thin continuous body, equally interwoven through all its parts with a proportion of thin yet a little condensed fire, (for were it not a little dense it could not heat) so that it is very like to the ambient ayr in substance and its other qualities.

2. Supposing it to be an ayr, we must conceive it to be continuous with the ambient ayr, when the eyes are open. This premittid, I infer light to be nothing else but a continuous obduction of the Ayr caused by a flaming fire. But let me here intreat your serious intention upon what I shall discover concerning the nature of Light, it being one of the difficultest mysteries of all Philosophy, and although its effects are luminous to the Eye, yet its nature is obscure to the Understanding. The search of this moved *Plato* to leave *Athens* and set saile for *Sicily* to speculate those flames of the mount *Aetna*. *Empedocles* the Philosopher hazarded himself so far for to make a discovery of the nature of a flame and its light, that he left his body in the Mongibell fire for an experiment, although much beyond his purpose. It is almost known to all, how that the Learned *Pliny* took shipping from the promontory *Misenas* to be traversed to the Mount *Remponianus*, whither curiosity had driven him to fathom the depths of the Vesuvian flames, but before he could feel the heat the smoak smothered him.

III. First then I prove that Light is an effect of a flame. There is no flame but it causeth light, and by the light we know it is a flame; *Ergo*, Light is an inseparable accident, and a propriety *quanti modi* of a flame, the Antecedence is undoubted; Doth not a Candle, a Torch, a focall flame cause lights? Or did you ever see light and doubted of the flame of it? What is the reason, when we hit our fore-heads against any hard thing, we say there strikes a light out of our eyes? It is, because the violence of the stroke did discontinue the optick ayr, through which the condensed fire * did unite and diduct the intrinsick ayr, which was incrassated through the same stroke, and so made a flame, or rather a flash, which is a sudden flame, that is quickly lighted, and quickly laid.

Secondly, Light is not a single quality, inhering in fire alone: for were it so, then where ever fire is, there should be light; but to the

* That is the spirits dispersed through the optick ayr.

the contrary we find, that there is fire inherent in the ayr, and many other bodies, yet the ayr remains dark after the descent of the Planets. 2. Were fire naturally light, we could never be in darkness, because the vast Region of fire is so large, that it could not but illuminate thrice the extent of the ayr.

Thirdly, Light is not fire rarefied and exporrected throughout all the dimensions of the ayr : for who could ever imagine, that a Candle, being so small a flame, should serve to be drawn out through the ayr, and fill it with light to the extent of six or eight Leagues ? for a Candle may be seen at Sea in a clear dark night six or eight Leagues off or further, so that it is absurd to imagine this, and unworthy of a Philosophers maintaining it. 2. It is impossible that fire could be so exactly mixt with ayr in an instant for so large an extent. 3. There is never a particle of illuminated ayr, but it is light to the full extent of the illumination, if so, then there must be a penetration of bodies.

Fourthly, Light is not fire rarefied ; for were it so, then that fire which is most rarefied should be lightest, but the consequence is false, *Ergo*, the Antecedence also. I prove the falsity of the consequence : Fire in Brimstone, or flaming Brandy is more rare than the fire of a Candle, and yet it doth nothing near enlighten so much as the flame of a Candle. Fire most rarefied, as it is naturally, is not at all light *. Lamps have burned in Tombs for many years together, and have enlightned the same for as many years ; but it is absurd to conceive, that fire could have lasted, or been sufficient to be rarefied through the ayr for so many years ; some simply deny the possibility of it, although the same may be brought to pass at this present time.

4. Where light is there is not alwaies heat near to it ; for if the contrary were true, then an equal light must have an equal heat ; but this is averred to be false in *Greenland*, where in their day-season it is as light as it is in the East-Indies, and lighter than it is in the Indies in the Winter, and yet the heat in the Indies is infinitely more intense than it is in *Greenland* ; for here it is never hot, although less cold at some times above others. Some Author makes use of a musical Instrument of *Cornel. Drebbel* to prove against all sense and reason that where ever Light is, there is also heat. These kind of Instruments are common enough now adaies ; they were Organs and Virginals that played by themselves ; *All which* (saith

* That is
lucid.

* That is
equal in
proportion,

the Author) depended upon the rarefaction and condensation of some subtil body, conserved in a Cavity within the bulck of the whole Instrument: for as soon as the Sun shined, they would have motion and play their parts. And there is no doubt, but that grew out of the rarefaction of the subtil Liquor he made use of, which was dilated as soon as the ayr was warmed by the Sun beams. Was ever a wise man so much wronged as to be made to believe, that a little subtil Liquor could blow the bellows of Organs, and that the beams of the Sun should penetrate through Boards and Iron and rarefie the Liquor contained therein; and that the interposition of a cloud should lessen the sound of the Instrument; if so, why should not the interposition of a board rather lessen the sound? for a board shall keep away more heat from a thing than the interposition of a thin cloud. The business is this, there was no heat required to the motion of the said Instrument; for had there been so, a fire made in the Room could have supplied the action of the Sun after its descension. The Instruments were made to move by a piece of Clock-work, which was placed near to the keyes; the work it self was moved by weights hung to it, or otherwise by a thing made within it like to the spring of a Watch; now when the wheels are almost run about, then the keyes strike feebler, and so the sound is diminished; this he calls the interposition of a cloud; neither is there any such rarefaction as he imagines to himself, and therefore is infinitely mistaken throughout his Book in the nature of rarefaction and condensation: Wherefore this is no proof that the Suns light is alwaies hot.

2. The same Philosopher argues, That the reason, why we do not feel the warmth of Light, is because it is not hot enough to move our tact; for that, which moves our tact by heat, must be of the same warmth, or hotter. This is another supposed subtilty of his. That, which is not warm, cannot be said to be hot, because heat is a degree above warmth; now in case there is so little warmth in a mixt body, that the cold of earth or water doth overcome it, that body is not to be called hot, or warm, but cold; even so it is here, in case that Light hath not so much heat as to warm, but rather cools, as we feel it enough in the Winter, it is not to be said to be hot, but cold.

VVho could imagine that a Candle should heat the Ayr twenty or thirty Leagues about, its light extending about in circumference to little less?

IV. *Light* is a continuous obduction, or thrusting up, or puffing up

up of the ayr, which puffing up is, as it were, an opening to the whole body of the ayr, in the same manner almost as wind being puffed under: water raises and puffs up the whole body of it to a large extent, by which the water seems to be opened throughout all its body. I say it is *continuous*, for were it a disruption of the ayr and not continuous, it would cause a sound. A *continuous obduction* is an equal drawing up or support of the ayr to the Circumference: That, which doth originally cause this obduction, is the fire condensed, which bears the ayr up equally and circularly, like as when you blow suds up into bubbles, which likewise seems to create a light. The ayr being obducted originally about the light, its whole body is also obducted to a far extent at the very same moment: For supposing that the ayr is continuous, and that there is no such condensation (as the Vulgar imagines) as is effected by penetration of parts or diminution of quantity, the ayr being trust up at one place, must also be trust up all about to a certain extent: The same is manifest in water, by puffing a thick wind through a Reed underneath it, which little wind (although unproportionate to the heavy body of water, which it raises) puffs up all the parts of water at once, that is, in a moment; the reason is, because the water being continuous, and nothing between it throughout all its dimensions but what is continuous, lyeth as continually close (which is the nearest closeness) as can be conceived; wherefore puffing one part up, you must necessarily at the same instant puff up all the other parts about it; because they cannot introwede into one another. Or otherwise, the reason why so impropportionate a body should suffice to bear up so heavy a body as the water, (for a puff of wind, if it be blown deep under the water, will raise fifty pounds of water, more or less, according to its force) is, because the wind having moved the nearest parts of water, they bear one another up continually unto the very Surface. So it is with the ayr being puffed up by the fire, which at the same instant doth puff up all its parts about.

Here you may object, If the ayr be obducted in that manner by the flame of the fire, and that it giveth way continually throughout its whole body without an intrinsic inflation, then the least fire must stir the whole tract of Air about it. I answer, That the Air is partially inflated*, and not thorowly throughout all its dimensions; wherefore when it is so puffed up it is only obducted in its extent according to the force of the flame: and when it is so

stretch

* To wit
extrinsecal-
ly by pene-
tration water

* That is
homogene-
ously con-
tinuous.

stretcht (as it were) through the fires obduction, it receives the force of the flame partly only, because it is contracted by expelling the extrinick bodies contained within it, & so yields to the fires obduction. The clearer the ayr is, the greater light it makes, because it containing no extraneous bodies cannot contract it self from the obtention of the fire by expelling such bodies, but being totally continuous it is obtended so far as the said ayr is continuous *, and according to the force of the fire. The reason then, why a light is terminated, is through the contraction of the ayr, and oft times through the density of an intermediate body as of thick vapours and exhalations. According to the diminution of the flame, the ayr relaxes and so the light diminisheth.

V. The cause why a dense body is incapable of generating a light, is by reason it is contiguous, and cannot be obducted, or stretcht, as it were.

I have said, That that is light which moves our eye-sight: even hence I wil sensibly prove to you, that light is nothing but a continuous obduction of ayr. Suppose that the optick spirits are for the greatest part an ayr, to which the external ayr, when the Eye-lids are open, is joyned in continuity and becomes one continuous body with the optick ayr, in a manner as when one float of water toucheth another they become continually one. Wherefore then, when the ayr is continuously obducted, as far as where it is continued to our optick ayr, it must necessarily also obduct and stretch the same optick ayr, because it is continuous to it. That light moves the sight by stretching the optick ayr is evident, in that when we look against the light, although its origin is far off, we feel a stretching in our eyes. 2. VVhen we have wearied our selves by seeing we complain that we feel a stretching in our eyes. In case the ayr is not obducted so far as to reach our eyes, then we do not see it; as when a thing is out of sight, the reason, why we cannot see it, although nothing is interposed to hinder, is because its stretching doth not reach as far as our Eyes. Hence you may observe, that (*visus non fit emittendo sed recipiendo motum flamma.*) sight is not actuated through the emission of beams from our sight, but through the receiving of the motion of a flame, and more through suffering (*paciendo non agendo*) than acting.

VI. The fire of a Flame is to some extent dispersed through the Ayr, and so far it heats the Ayr: nevertheless its enlightning is much

much further extended. The Sun, which is the greatest Flame, its heat in the Summer reaches to us in a very intense quality, its light would reach a hundred or more times further then it, were the tract of the Ayr extended to a larger quantity; but because it is not, therefore its heat in the torrid Zone, and in the temperate ones in the Summer, reaches as far as its light, which although it doth, is not therefore to be accounted the essence of Light, as some have simply imagined. So that it was no less Mistake to believe that the Sun's light could be precipitated in a Glass, and some to have collected of it no less then two Ounces and half a day: The vertue of this Precipitate is described to penetrate into the substance of the hardest Metal. I do believe that it is very possible to precipitate such small bodies constituted out of the fiery emissions of the Sun, whose vertue cannot but be very penetrative through the predominance of fire in them; but nevertheless it is not the light which is precipitated, but fiery substances, neither is fire the light it self, but the cause of it. Light is a property following the union of a flame with the Ayr, wherefore the Ayr is rather to be taken for the principal Subject.

VII. Light is not the primar cause of all the effects produced by the Stars, but their temperament and exsuperating heat. Accidentally or privatively their remoteness and remission of heat may be a cause of coldness, and incrustation of the Ayr, and consequently of its obscurity. The light of the Sun doth not comfort the vital Spirits, neither doth it act immediately upon them at all, although through its heat it may help and excite the vital heat of some frigid temperatures.

The light hath only a power of acting immediately and *per se* upon the Optick Spirits, and through altering them, may prove a mediate cause of Vital and Animal Alterations. I prove it. If you go forth out of the dark into the light, you feel a distention, or rather an obtension of your visive spirits; return again out of the light into the dark, and you will first perceive a relaxation, and afterwards a contraction of your sight. The mediated effect of light is a quickening of the Vital and Animal Spirits, which are moved by continuation from the obtension of the Optick Ayr.

A sudden great light causes a bursting of the Air; which happens, when the Air is so much obtended, that it can stretch no more, and then, of a necessity it must burst. A bursting is a sudden breaking off a body,

a body throughout all its dimensions and parts as it were. The air is bursted through a great lightning or a flash before a thunder, which if the same bursting do reach diametrically to the optick air of an open eye, it will certainly blind yea sometime kill a man, because the same bursting is continued unto and upon the optick spirits, and sometimes is also further continued, that it bursteth the whole Treasure of the Animal spirits, which necessarily must effect an *Apoplexy*. A man coming forth suddenly out of the dark into a great light, is often struck blind, because his optick Spirits are bursted through the sudden and strong obtention; or if it obtends the optick Air to the next lower degree, so as it may not cause a bursting, it then produceth a dazling of the sight, that is, an over-stretching of the optick spirits.

VIII. How light renders all things visible is a matter worthy of Enquiry.

The air being thus obtended and made visible through light, is terminated every where about by the surfaces of terminated bodies. These terminated surfaces resist the obtended air, and according to their several degrees of mixture or of fundamental light and darkness do attenuate, refract, diminish, contract or condensate the obtension. If the surface of the resisting object is continuous and weighty, it attenuates and refracts or reflects the light of the air; and of that nature is water, for water being adunited to air in continuity, doth not only sustain the obtension of the air, but also through its reflexion obtends the obtended air yet more, and so the obtension upon the water must be greater, by reason it stops the obducted air more then any thing else; wherefore its light is thinner, but withal greater, & makes all bodies therein contained shew greater. Besides, water containing much air in her body, suffereth also an obtension of that, whereby bodies must necessarily appear bigger then they are. The reason why a piece of Money in a Basin with water appears bigger then it is, is because the water through impregnation with peregrine air, proper thickness and continuity doth reflect, and admit much obtended air or light, which being altered by the colour of the money, doth appear much bigger, then if seen through thin air alone.

Light is diminished, because the air is condensed, so that whatever doth condense the air must diminish its light and obduction. Whatever body light appulses against, it is thereby darkned, because the

the body, which it strikes against, condenses the air.

According to this degree of condensation, the light is gradually diminished, and darkned; if it be terminated in a most dense earthy body, then it appears *black*; if against a body, that hath less earth, or density, it appears *brown*, that is to say, at the point of reflection against an Object; and so gradually in all other.

This change being wrought upon the terminating obtension by an objected body, it is repercussed to a certain distance, namely, as far as the repercussive action of that object can reach, which is as far, as until the Air doth recover its proper station. If we are far off from an Object, it appears less then it is, because its action doth diminish gradually like unto the streams of water, which about the center of action are greater, but the more remote they are, the less they grow.

A Flame is called a *Light (Lux)* because it begets light. The light begot in the Air is called (*Lumen*) an *Illumination*. Wherefore these lights are not really distinguished, but *ratione*. Neither is a flame to be called a light, unless when it doth obduct the Air; neither is the Air to be termed a light or illumination, unless when it is obducted by a flame.

Radius, a *Beam* is a diducted line of a flame tending directly from the Center to the Circumference.

A *Splendor* is the intention of light by a reflection or refraction upon a thick continuous smooth body.

The Lights begot by the Stars, and other flames, are not distinguished *specie*, because they depend upon the same causes, namely, upon Fire and Air. Their difference consists in consistency, purity, bigness, &c.

The *Cælum Empyreum*, or Heavens of the Angels are said to be lucid; which may be understood tropically, or properly. If properly, possibly it hath a vertue of obducting the air like unto a flame. If tropically, lucid is equipollent to glorious. The Bodies of the risen Saints shall appear glorious and splendid, possibly because they shall be more airy and fiery, that is flammie.

CHAP. XXII.

Of Colours.

1. *The Authors Definition of a Colour. That Light is a Colour. Aristotles Definition of colour examined.*
 2. *Scaligers Absurdities touching Colours and Light.*
 3. *What colour Light is of; and why termed a single Colour. That Light doth not efficienter render an Object visible. How a mixt Colour worketh upon the sight; and how it is conveyed to it.*
 4. *The Causes of the variations of Mercury in its colour through each several preparation.*
 5. *That Colours are formally relations only to our sight. That a mixt colour is not an intentional quality. That besides the relation of colours there is an absolute foundation in their original Subjects. How the same fundamental colours act.*
 6. *That there are no apparent colours, but all are true.*
 7. *The Differences of colours. What colour focal fire is of. The fundamental colours of mixt bodies.*
 8. *What reflection of light is. What refraction of colours is. Aristotles Definition of colour rejected. The Effects of a double reflection. The Reasons of the variations of Colour in Apples held over the water and Looking-glasses. The variation of Illumination by various Glasses.*
 9. *The Division of Glasses. The cause of the variation of colour in a Prism.*
 10. *The Nature of Refraction. Why colours are not refracted in the Eye.*
- I. **C**olour is a Mode or Quality of a mixt being, through which it moves the sight: if so, then certainly Light is a Colour: For,
1. It proceeds from a mixt body.
 2. It moves the sight primarily, immediately and *per se*. I prove it. We do distinguish light from darkness, and a light body from a dark one by our sight; *ergo* it moves the sight.

Probably you may deny my Definition of colour; wherefore I shall

shall for your further satisfaction compare it with that of *Aristotle*, and prove it to be consentaneous to it, differing only in Precision, ours being less universal and nearer to sense than his. *Lumen* (which is equipollent to colour) *est actus perspicui quatenus perspicui*. Light or rather Illumination is the act of a perspicuous body: *quatenus perspicui* is redundant. By *actus* is implied an actuation or motion.

2. By *perspicuous* is intended a body, that is capable of receiving or rather of reflecting light; And is not the sight capable of receiving or reflecting light, and of being actuated by it?

Or if you will take colour for a quality, following the temperament and mixture of the Elements, the difference is not great, this being a Definition of colour as it is considered in it self *a priori*; the other described *a posteriori* relatively and accidentally; for it is *per accidens* to it to move the sight. I cannot but reflect at *Scaligers* boldness, who pretending to exceed *Cardan* in subtilty, so as he seemed to reprehend and correct him in every Distinction, but with more absurdity then he supposed *Cardan* to be less subtil; and particularly about Colours and light, *Exercit. CCCXXV. d.* 2.* Here he infers a real and formal difference between an Accident and its Subject; the contrary hath so plainly been demonstrated.

2. That an Accident is constituted out of a Power and Act. The falsity of which is detected in my *Disp. of Pow.* These Assertions are not exempted from Absurdities.

1. An Accident and a Substance being really and formally different, and owing their production to one substantial efficient, it follows that a Substance produceth effects differing from it self in *specie*.

2. That a Substance is an efficient of a Power and Act. Power and Act being two positive contraries, one substantial efficient is inferred to be an efficient *secundum idem ad idem* of two positive contraries; for a power according to *Aristotle* is not a privation; for then it were a *non ens reale*, but a positive.

3. Neither is Power or Substance the true master of colour. Not the power; for that is like to the matter: not the substance, that being the sole whole substance: Wherefore if neither power or substance be the true matter, it cannot be any real thing; because whatever is real consists of Matter and Form. *Wherefore* (saith he) *we should say that it hath a substance for its subject, wherein it is inherent; but in it self it hath a power and act out of which it is made one in the subject, and distinct from the subject, out of which essence that property of visible is produced.*

* Compare the quoted place, other wise you will scarce apprehend the sense of these consequences.

produced. A manifest contradiction: First he saith, that an Accident hath alwaies a substance for its subject, and yet in it self it hath a power and act. Assuredly none will affirm a power to be in an accident, but in the subject for to receive such an Accident; this he alloweth himself: for an accident (saith he) is alwaies in a substance as its subject; *ergo* it hath its essence from a subject: if then a subject giveth its essence, it giveth *præcedentia* and *consequentia esse*: it is then the power that is from the subject, as also the act; *ergo* an Accident is nothing but the subject modified.

4. Constituting Principles, as Matter and Form, are required to exist at one time: but the power and act cannot exist at one time; for as soon as the act is advened, the power is fled. If then you assert it to be a *principium generationis*, then the subject thus constituted doth consist of a Principle *per se*, and another *per accidens*: Besides it followes, that an accident is an *actus purus*; if so, then an accident is more perfect then a man or an Angel. Wherefore it appears that a colour is nothing else but a modification of a subject, and of the same rank that other accidents are of; besides, that colour is exempted from a power and act, and that the substance is rather to be conceived to be instructed with a power of being coloured. The subsequent distinction confirms my Interpretation of his words: For (saith he) *light is an act of visibility*: that is, it is an action upon a visible substance; for visibility in the abstract being invisible, he ought rather to have declared how a lucid substance acted through its modality, or action upon our sense. The same Scaliger in the said *Dist.* asserts, that Light is neither white or whiteness. No doubt it is no whiteness; for that he never saw existent without a body, unless it was a Spirit in his Fancy: But the question is, whether it is not white? His Argument alledged against it is, because it cannot be seen in the Air, and doth not terminate the sight. The former condition of his Reason is *simpliciter* necessary: the latter is only necessary (*necessitate consequentia*) by consequence. I reply to his Argument:

1. That light is visible in the air, as I have shewed before.

2. Light were it imaginable to inhere in an infinite subject, it would be interminate, and yet move the sight terminately; for a man who is blinded by a thin Cataract, knowes when it is day, and when night, because the light of the Sun moveth his Optick Air, although very obtrusely, and yet he neither sees the termination of the Sun, or of the Air.

3. Light

3. Light is not invisible, because of the thinness of the Air ; but visible, because of its obductibility.

4. The air's intermination is falsely supposed to be the cause of its invisibility : for it is really terminate, because a being and termination in the concrete are convertible. Further it is evident, that light must be necessarily terminated both in the body, whence it is derived, and in the body wherein it is received ; notwithstanding it is not always necessary for us to perceive or see the light's termination in it self ; for that we seldom do, although it is terminated in and by our sight. According to our foretated definition light is accounted a colour, but most single, that is, without any composition, or reflection.

II. I call light a single colour, not absolutely, as if it were so in its own nature and constitution, but because it moves our sight singly without representing any mixt colour with it to the sight. This single motion of light is only its obfension continuatd in the optick air, & is otherwise known by the name of an *interminate Pellucid* *. In case light be reflected and gathered in great quantity by air thickned and somewhat condensed by thin and by a little condensed clouds, it produces a thick pellucid or whiteness in the air, which continuatd to the optick air, produces the same whiteness there. This we perceive when the Sun is said to shine, which it doth ever, when no thick dense clouds are interposed, & that its Raies are condensed by thin clouded air being a little condensed. That the thin shining light is whitish, is further apparent by the *Peripatetick* description of white. White is a colour, which doth most disperse the sight ; but so doth the Sun shining light ; *ergo* it is whitish. Or according to others, White is that, which containeth much light : *ergo* light is most white : because (*propter quod nunquam tale est, illud magis tale est*) Light being the cause and fountain of white, must be most white in it self.

* Because it is represented without being terminated by any mixt colour.

III. Light (*Lumen*) is *actus visibilitatis* (saith *Scaliger*) that is, it renders a visible thing visible : But how ? not *efficienter* (for then without light in the air there should be no fundamental colours, and every colour must be produced through light at the moment of its appulse) but as a *medium* or *causa sine qua non*. As a *medium* in that it doth defer the *ratio obductibilitatis* of every Object to the eye. The manner of it is thus ; every mixt colour is nothing else but the degree of the alteration of the mixt objects wrought upon the air by their

their greater or less pinching, contracting, or deadening of it: Supposing that the greatest extension of the ayr causes a pellucidness, that which gathers, contracts, or deadens the ayr a little and staies its ob-
tension is *white*; that which gathereth it yet more is *yellow*. That which doth gather it most is *black*, that which gathers it less is *brown*, and so gradually. This gathering of the obtended ayr by the objected mixt colour is a kind of a pinching, whereby the ayr is continually pinched, to the extent of a certain Sphere. The ayr being pinched doth continually pinch the optick ayr, which if it be a little pinched by an objected colour, it discerneth it to be white, or if very much it discerneth it to be black; hence when we enter into a mourning Room hung about with black cloath we perceive a perfect pinching or contraction in our Eyes.

*By pinching here do not understand a greater obtension, but rather a relaxing or withdrawing from, or a contraction of the light, and drawing of it from the sight by being relaxed, drowned, & deadened by a dense weighty body.

Here may be demanded, Whence this various manner of pinching proceeds, since that pinching is caused by a solid object, if so, then the solider an object is the more it should pinch, and consequently the blacker it should be, which seems erroneous; for Gold is of a yellow colour, which otherwise should be blackest, because it is the most solid of all bodies. I answer, That this various manner of pinching * depends upon the degrees of the gathering of light or obtended ayr. That which doth most gather or deadens the ayr, being a continuous or fluid body is a dense and contiguous body; so that the more dense that a body is, the more light it gathers, and pinches the stronger, and consequently is the deeper coloured. But that, which is continuous although very thick yet it gathers nothing near so much as a continuous body, because its continuity hinders its pass, and so the light reflects upon it and produces a splendor, whereas a contiguous body divides the ayr and giveth way for its entrance, and so it pinches, and next darkneth it. Wherefore Gold being continuous, that is, consisting of much water condensed, and ayr incrassated, reflects the light, and so produces a splendor. Now, that Gold consisteth of those moist parts; I prove it, because Gold contains a Lenton in it, (which is a concomitant of water and ayr, as I shewed you before) for cast a piece of Gold into the fire, and let it lye there for some proportionate time, and being taken out you may diduct it into any form or figure, and turn or bend it any way. Since that Gold consisteth of a proportion of continuous parts, it is thereby rendred splendid, and yellow from the proportion of contiguous parts contained within it. Wherefore if you

you reduce Gold into a *Calk*, you deprive it of its splendor; because you have taken away its continuity of parts.

IV. Give me leave to demonstrate to you the reasons of all the various colours which *Mercury* attains to through its various preparations; and thence you may collect the reasons of Colours befalling all other bodies, (whether Mineral or Vegetable) through their several preparations.

Mercury is 1. splendid, because of its thick continuity of parts.

2. Its Silver-like colour derives from its paucity of contiguous parts, which it containing in that small quantity doth render it a little darker than white, and is the cause, why it is not pellucid like unto water.

3. The reason why *Mercury* becometh white like unto a white frost by being dissolved by *Aqua Fort.* is, because it is diducted and attenuated through all its dimensions, and therefore collecting and pinching the light a little only, it appears white *.

4. *Mercury* changeth into a yellow colour after it hath been dissolved by oyl of *Vitriol*, and being separated from the dissolvent by exhalation it abides white, but being cast into water it changeth yellow.

* Or rather
by coagulating the
whole salt
of the *Aq. Fort.*

The whiteness, which remains in *Mercury* after the evaporation of the oyl, is, the colour of the corrosive salt coagulated into an attenuated body by the Mercurial vertue. The casting it into water doth deprive it of the forementioned salt, which is dissolved into water; that, which doth remain, is the courser part of the salt incorporated with the *Mercury*, whose substance contains such a proportion of earth as to gather so much of the obtended ayr and to pinch it into a yellowish colour.

5. The whiteness of *Mercury* sublimate corrosive, and of *Mercury* sublimate Diluted derives more from the attenuated salt, than the body the *Mercury*.

6. The same corrosive *Mercury* sublimate dissolved into fair water and precipitated by oyl of Tartar changeth into a clay red; Here you must not imagine that it is the oyl of Tartar in a drop or two doth colour the whole substance of the precipitated body; for it self is of another colour, besides were it of the same it is impropionate to colour a whole body by a drop or two. It happens then through the deprivation of the thinner parts of the corrosive salt swimming in the water. That, which the oyl of Tartar performed in
this

this preparation, is nothing but to free the body from its detaining spirit, which it doth by attracting it to its own body, and uniting it self with it into a small body; the red colour depends upon the quantity of thickned earth of the precipitate.

I shall not importune you with the relation of colours befalling through other preparations, since you may easily infer a reason of them from what hath been proposed concerning the variation of colours in Mercury.

V. From this discourse I do further infer, 1. That the formality of colours doth mainly consist in a respectiveness and relation to our sight, and is nothing else but what man by his sight discerns it to be, for had man no sight there would be no colours, although there would be an alteration upon the ayr extended. Likewise light would not be light but ayr obended: So that I say the *Absolumm fundamentum Relationis supposita* would be there, but not *ipsa relatio*, because the *Correlatum* is defective. The like understand of sounds, sents, or tastes, which as to us are nothing but certain realities moving our animal spirits by certain respective modes, which realities moving the senses in certain modes are called such or such sensible qualities: what they may be further really in themselves we know not, because we perceive no more of them, than what we call such and such; the others, although real, yet we suppose them to be *non entia*, because we do not perceive or know them. But I prove the Proposition, *All positive and absolute beings perform their actions responding to their modes*; But none of these fore-mentioned qualities may be so termed sensible qualities (to wit, colours, sounds, &c.) unless modifying the senses.

2. That a mixt colour is not an intentional quality produced by the coloured object in the ayr, but a real quality, really inhering or effected in the ayr by the original action of a fundamental colour. What shall an intentional quality act really? *Ergo, Quidam esset in effectu, quod prius non fuerit in causa*, which contradicts that Maxime concluding the contrary. Besides, colour would be affected with two sorts of accidents, one really inherent in the object, the other in the ayr. 3. It supposeth accidents to migrate *è subiecto in subiectum*, which is impossible. Nevertheless *Scaliger* pretends to prove Light to be a quality produced in the ayr and distinct from the efficient; that is, that *Lumen* is really distinguished from *Lux*, if so, then *Lumen* could exist, when *Lux* is separated and removed from

it;

it; but that cannot be, *ergo*, there is no real distinction between them. According to the same rule we might raise a real distinction between the coloured object immediately altering the ayr, and the colour or *lumen* produced in the ayr from that colour being a *Lux* in comparison to the other. This real distinction is rejected by the same Arguments: because a colour in the ayr or a *Lumen* cannot exist, when the colour (or *Lux*) in the object is removed.

3. That notwithstanding the respective formality, there is a real foundation in coloured bodies, which is a certain degree of temperature, whereby they being somewhat contrary to our sense move and act, but mediately, upon its temperament.

4. That through this absolute foundation a colour doth move or act really upon the ayr, and through it upon other inanimate bodies, yet not as it is a colour, but as it is an absolute foundation or a degree of temperament. This motion is not very considerable; for although it may move a light thin body out its place, yet it will hardly move locally a thick or dense body, wherefore it is ridiculous to opionate, that *lumen* of the Stars, otherwise termed their Influences, should be the causes of so great effects upon great bodies, as are ascribed to them.

VI. Colours are generally divided by the Peripateticks into two sorts, *viz.* into true, and apparent. *True Colours* are such as do really inhere in their subjects in the same manner, as they are represented to the eye. Apparent ones are those, which are not really inherent in their subjects in the same manner as they seem to be to our sight; such are the colours of a Rainbow, or of a Peacocks feathers, or of the Sea-water: because these according to the several distances and position of the eye seem divers. The cause they impute to the light (*Lumen*) which according to its various aspects renders the said colours various: the error of this Doctrine will appear from these Conclusions.

1. All Apparent colours are real and true colours; as for their being real colours but few do doubt of it, because they do really move the sight. That they are true colours I prove hence: That, which is a real colour, must be a true colour, because a *being* and *true* are convertible (*ens & verum convertuntur*;) wherefore if it be a colour it must be a true colour, or else none; for it doth as really and truly move the sight as that which is strictly called a true colour, or how should we see it else? To this you reply, that you do not

Y y

deny

deny it to be true a colour in one sense, namely metaphysically; but in another, and in respect to a true colour strictly so called, it is not true. I answer, That all the difference I find between them is, that the one is more durable or less changeable than the other, which doth not make the one more or less true than the other; for did an apparent colour move the sight otherwaies than it doth, it would be no true colour, but it moves the senses as it is, and to most mens sight it is the same continuing its duration: For when we see a Rainbow, its colours do appear the same to all standing in the same place; but were they not true, they would appear in one shape to one, and in another to another. As for their different appearances and shapes at several distances and positions is as well incident to those, which they call true colours, as to apparent ones; For a Picture, where the colours are all real and true, will vary at several distances and positions. You will say, That a Picture will not vary in colour, if you look upon it from the right opposite place, where the light is cast in a due proportion. I answer, Neither will that, which you call the apparent colour of a Picture vary, keeping the same place and distance: And what difference can you then make between them? The only difference between them is their more or less durability and changeableness which proceeds from its greater or less compactness of mixture. The colour of a Rainbow is as true a colour at that position and distance, as of any other object, it differing alone in durability; for suppose a colour to be altered by a reduplication or over-casting of another colour in substance, but the same in appearance; as for instance, a painted face having its natural colour hid under a painted colour, certainly you will say that the latter is only an apparent colour; if so, wherein is the latter different from the former being a true colour (as you call it) but in durability? To wit, the paint wears off, and the other abides. The same is observable in the clouds, whose lasting colour is blewish, their fading or painted colours are the rayes of the Sun incorporated with their bodies, really and truly altering their lasting colours; nevertheless this latter is as true a colour, as the paint was upon a painted visage.

VII. The differences and number of colours are various and many; for every temperament hath a several colour attending it: But as it was not every insensible alteration of temperament, that constituted a new temperature, saving that alone, which is sensible;

so neither doth every insensible alteration of colour constitute a new colour, but only such a one as is sensible. Colours are either durable and less mixt, (*mixti è paucioribus ; non vero minus mixti*) or changeable, and more mixt, that is, with extrinseck heterogeneous bodies : So that a durable colour arises from a compact temperament of the Elements included by extrinseck bodies ; the other depends upon a less compact union of the Elements.

Changeable colours are various also according to the lights *reflection*, or *refraction*, and its various *incidencies* upon objects which causeth them to appear either whiter or blacker, or otherwise lighter or darker. A changeable colour is sometimes accidental to a persistent colour, as appears by the fore-mentioned instance of a painted face.

Colours are *extreme* or *intermediate*. *Extreme* ones are such, as cannot be intended or heightened in their action, as black (I mean that, which is blackest) cannot be heightened ; that is, it cannot be supposed to pinch and drown the light more than it doth. These extreme colours depend upon the extreme or greatest proportion of the superating Element in reference to the whole : So that in case fire is the greatest predominant, its body is white ; if the earth, its subject is black. According to this supposition there are four extreme colours, because there are four extreme proportions of the Elements : Which are these ; *White, Black, Crystalline, and Pellucid*. This is made known to us, 1. In that Sea-coal consisting of most earth is black. 2. A Flame consisting of most fire, is white, to wit, the Sun. 3. The Air consisting most of airy parts is Pellucid. 4. Ice consisting most of waterish parts is crystalline. I will further prove this by reason : If blackness be proper to earth and earthy bodies, whiteness must be proper to fire and fiery bodies, they being opposite correspondents to one another in all qualities. The colour, which is in water and waterish bodies, is neither white or black, *ergo* it must be an extreme colour of it self ; for since that each Element obtains distinct extreme qualities, the same must also be in colours. Who would say that water is white or black, or partakes of any white or black from fire or earth ; wherefore *Theophrastus* was to be blamed for ascribing yellow to fire, and white to the three others. That, which moved him to appropriate yellow to focal fire, was, because for the most part in flaming or burning it seems yellow and reddish. To this I answer, That the colour of

focal fire is not an extreme colour, because fire is not inherent in focal fire in its greatest proportion and predominance, it having much earth to obscure its extreme whiteness, and so it is turned to a yellow or red, but where fire is in his greatest predominance and least counterpoised by earth, there it seems alwaies white, as appears in the colour of the Sun, and in oyl or fat cast into focal fire burning white. Here may be objected, That Snow is white; *Ergo*, it should consist most of fire, which it doth not. I repeat my distinction of durable and changeable colours, and affirm that whiteness depending upon fire is deprehended only in durable and compact permixt bodies; the other inherent in changeable subjects and thin open bodies derives more from the ingredient light entering their pores, where being a little pinched and collected appears white, so that this may be thought to be as much the colour of the condensed light as of the body, which lasteth no longer, than it is condensed by condensed water, and that being melted the colour vanisheth withall; possibly you will turn your objection to a bone, which being white, doth not contain fire predominating in it. I answer, That a bone consists of much fire and ayr as appears in its flammability, and therefore is white. Lastly, you may object, That a Marble stone or Alabaster is white, but neither are fiery. I answer, That both do consist of a condensed and attenuated water, and not without a little rarefaction caused by the fire. Suppose that Marble were only a natural water, which as I have demonstrated is naturally thick and consistent like unto Ice, and condensed with a little earth, certainly it would be of a transparent and crystalline colour; this Ice being yet more condensed by earth pinches and collects the light a little, and so appears white. Wherefore observe, that this white is primarily an extrinseck colour depending on the incidence of light, and not fundamental alone wrought by the internal temperature of the mixt body. So that this objection doth conclude nothing against our Assertion mentioning intrinseck colours acting from a compact mixt body. The reason why Marble and Alabaster are shining is, because their body is consistent of a continued substance, to wit, thick water.

Intermediate colours are such, as arise out of the descent of the Elements from their extremes: To wit thus, The less there is of fire, the less it is intrinsecally and fundamentally white; the less there is of earth, the more an object diminisheth in blackness: Which

Which degradations constitute the intermediate colours.

Intermediate colours are almost infinite, but enumerating them according to the above-stated condition of Latitude of Colours; they are vulgarly counted ten in number: 1. *Yellowish*, Subflavus, 2. *Yellow*. 3. *Reddish*; Subruber. 4. *Red*. 5. *Greenish*. 6. *Green*. 7. *Blewish*. 8. *Blew*. 9. *Brownish*. 10. *Brown*.

Red is an equal mixture of Black and White, and is the Center and middle of all colours being equally interjacent between the two extreams: so that all colours are between Red and White, and between Red and Black, as appears in the subnext scheme of colours.

Before I proceed, I will commend to you a very necessary distinction of intermediate colours, which are either fundamental or extrinſick. The fundamental intermediate colours are those, that are constituted by the internally proportionated Elements in temperament, and are compactly permixed. The extrinſick colours are such as are as much imputable to the external incidence and ingredience of Light.

This premittred, I say, that a fundamental Red doth only consecrate a body mixed and tempered *ad pondus*, which was alone in the *Chaos*, the noblest of colours befitting so noble a body. Of those red colours which we now have, a sanguine cometh nearest to it, because it proceeds from the exactest temperature *ad justitiam*, which is nearest to that *ad pondus*. The change from this towards the extreams (as before) constitutes a different colour: if to water, its change is into a green, as you may observe in the blood of hydropick bodies appearing greenish; if to air, blewith, as you see it doth in the clouds, which is changed out of a Red Cloud being dispersed into a greater measure of air; if to Earth, Brown: if to Fire, Yellow, which is manifest in Blood turning to a Yellow, if predominated by fire or Choller; to Brown if predominated by Melancholy or Earth; to Blew if attenuated or incorporated with predominant air. Besides these, there are many others, which because approaching to some one of the forementioned, I shall not think material to relate, but refer you to *Scaligers CCCXXVth. Exerc.* where you have the names of most colours set down.

What *Splendor* and the cause of it is, you know already: its opposite is a *deadishness*, which as splendor is effected upon a smooth and continued body, so is this effected upon a rugged and contiguous body.

Luminous

Luminous and *Opaque* are also Opposites. The latter is distinguished from black, in that this is taken for a fundamental colour, the other for an extrinsec privation of light.

VIII. *Reflection* of light is the beating back or reaction of a splendid or thick body upon the obtended air, which Reflection obtending and stretching the air yet more, then it was before makes it appear much lighter. That it is made lighter, is discerned by the eye, which is more forcibly obtended by the reflected light, which if it be much, causes a dazzling in the eyes, and is nothing else but an over-reaching of the optick air and Membranes, and sometimes is so great that it presses water out of the eyes. Reflection is only upon continuous bodies, as Gold, Silver, Brasses, Steel, Precious Stones, Glass, and Water, &c.

IX. *Refraction* of colours is a reflection seeming to be broke; as when you put a Stick into the water, the colour of it seems to be broke. By an internal reflection its colour seems to be more augmented in quantity and extent of parts, then really it is. The manner of it is thus: Mark that a superficial reflection doth not augment the extent of a colour, which reflects the light; for Gold or Crystal is not augmented in extent of colour, that is, seems not bigger then really it is by reflecting light superficially, neither do they render a colour in the air bigger then it is.

* Or a reflection continued.

2. A *double reflection* is the continuation of a reflection*; for there is also a reflection of light within the very body of an object, as you may see by a piece of Money cast into the water, or big Sands lodged sometime within the center of a Diamond or Crystal, causing a reflection although remote from the Surface; wherefore a Colour is not well described by *Arist. Lib. de Sens. & Sensil.* to be the extremity of a terminated perspicuous body; for I have told you where and how it may be visible in the intrinsic body of an Object. Notwithstanding this, *Scaligers* Objection, in *Exerc. 325. d. 4.* against colour stated to be the extremity of an Object, is invalid. His Objection is, because a Chesnut is coloured in the middle as well as in its extremity; *ergo*, saith he, Colour is not the extremity. But how did he know a Chesnut to be coloured in the middle? Questionless by seeing it cut through; if so, then that middle cut through is now come to be the extremity, & so there appears no great subtility in his argument. Wherefore I do grant that a fundamental colour is also in the center of an opaque body, but then it is no formal Colour, that

that is, it is not *actu* visible, except in the Surface *. Crystalline bodies are internally visible throughout all their parts, and do augment the extent of a colour. To augment the extent of a colour is to dilate it, or to make it less pinching upon the air, then it was without reflection: for example, an Apple seen through the air appears no bigger then it is; but if held over the water, and its colour perceived reflected, seems much bigger: the reason is, because the colour of the Apple pincheth the air, which air thus pinched beating against the water, is reflected, that is, is beaten back again, which reflection is a greater obtension of that air so pinched, and the same obtension or stretching must needs dilate that air thus pinched, which dilation is the augmentation of the colour of the Apple. The colour of the apple impressed upon the air by its pinching seems to be rendered paler through the said reflection, because the dilatation of the air being through it made lighter, doth through that light somewhat expel the obscurity of the colour of the Apple. Here observe, that this reflection is not a single reflection, but a reflection upon a reflection, which I call *double*.

* Namely of an opaque body.

I will more amply explain it to you: A single reflection is, which doth reflect upon the extream surface; and descends no deeper; thus it is upon Gold or Brass. The double reflection is, when this extream superficial reflection is continued and propagated by the circumferential parts next adjacent to the extream surface, which makes the first reflection stronger, and therefore more dilatating the coloured air, which more dilatating of the coloured air makes the colour appear sensibly larger, although the colour is somewhat dilated by a single reflection, but it being insensible, we do not state it to be larger.

The reason, why an Apple held over the water and seen at a certain distance obliquely from the side, appears much more enlarged then seen directly, is, because the light is reflected in a larger extent, and consequently the colour impressed upon it must be more dilated.

Hence you may also be resolved, why some Looking-Glasses render ones face bigger and paler then it is. This happens through the thickness of the Glass, wherein the second reflection is continued from some depth, and therefore doth more obtend the air, and dilate ~~is~~ impressed colour.

Thin and gibbous Glasses render a face less and swarthy, because they

they do less reflect the light, and rather loosen its obtension through their thinness,

A little piece of a plain Looking-Glass doth represent no more of the face than its bigness will permit; so that if it be no bigger than your eye, you will see no more in it than your eye.

A gibbous or spherical Looking-Glass, be it never so little, doth represent the whole face of a man, although but obscurely. Now let us enquire into the ground and cause of these different Representations.

Alhazenns and *Vicellio* seem to assert, that all colours are represented in a Pyramid, that is, by being equally fastigated from their extreame circumference unto a point of reflection; and therefore they term this optick Pyramid *simpliciter* an optick figure, as if all colours whether radial or luminous, were represented through it. But this is contradicted by the Experiment of a plain Looking-Glass, where the figure of an Object is not at all augmented or diminished, but reflected in an equal extent, as it is represented through a simple vision. Notwithstanding it holds true in Objects reflected upon spherick Looking-Glasses, where (as I have proposed just now) objects if circular, are reflected in a conical optick figure, and if lineal, their radiature is reflected in a triangular or pyramidal optick figure. The *truth* of these is vulgar enough; but the *reason* I could never hear from any.

1. It is certain that all colours are represented through their direct Rayes, or in direct Lines.

2. These Rayes are nothing else, but the pinchings of the luminous air by the Objects.

3. These pinches being plain or sometimes bubbly are equally and plainly reflected by a plain Looking-Glass, and therefore the Object reflected seems equal to the Object when perceived by a simple vision. But in case the Object be reflected by a spherical Glass, then the central parts of it are reflected by the extreame protuberance of the Glass in a sloping manner; not plain, because the body reflecting is not plain; for it is the reflecting body, which gives it its extent of figure, as I said before; if it be plain, it reflects that bubble plain, that is, stretches it out to a plainness, which must be full as big as the Bubble can stretch out. But the reflecting body not being plain, but falling slopingly, the coloured air falls down with it, and is thereby contracted into a lesser extent in the same manner, as when
you

you spread a Handkerchief upon a plain table, the Handkerchief thus extended is of a larger figure then when you cover your head with it, where its figure is contracted to a less compass, because of the declining figure of the head.

IX. *Robert Flud Tract. 2. Part 4. Lib. 4.* sets down this division of Glasses :

A Glass is either regular, or made up out of regulars. A regular Glass is plain or difform. The latter is 1. A Concave, which causes a thing to seem bigger then it is. 2. Convexe, which causes a thing to seem lesser then it is. 3. & 4. Pyramidal and Columnal, making a thing to appear longer then it is. 5. Spherical, which causes a thing to seem broader then it is. To these difform Glasses, Cylindrick, Conical and Parabolical Glasses are to be referred. The causes of their various reflections you may easily deduce from our Discourse; wherefore I shall spend no more time about it.

The obliquated Radiatures of an Object are propagated to a certain distance and sphere, beyond which the said Object is invisible. Hence you may know why a piece of Money being placed in a Bason, and going back from it until it is out of sight, comes to your sight again, if you cause water to be powred upon it. The propagation of an Object reflected is circular, and therefore to as many as can stand about that Bason where money was placed in, the same will appear.

The various Colours appearing to the eye looking through a Prism are effected through the gradual diminutions of Light passing through the depth of the said Prism, and modifying the Sand contained within the body of the Glass, the same colours do also appear to us when we see against the Light through a Glass full of water.

X. But to pursue my discourse of Refraction. There must not only be a Reflection, but also a discontinuation or abruption of planeness or equality of the Body reflected, and thereby it becomes as it were, two Bodies, and is reflected also in a double *Species*; but were it continued in equality, it would be expressed but as one single *Species*.

The reason, why an inequality in one continuous body causes a refraction, is, because every protuberance contracts the *Species* of an object reflected upon it, and consequently must represent each of them in a several *Species*. Wherefore a Prism doth represent the

same colours of each side of its angle, because of the Refraction of the Light arriving through the Inequality of the Angle.

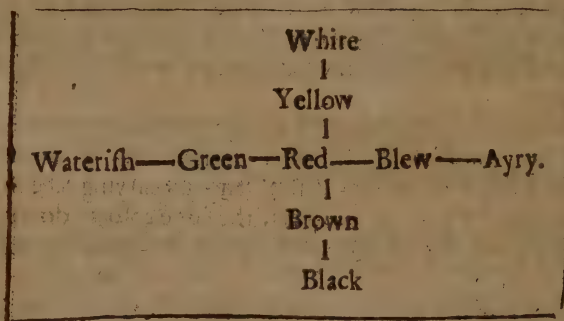
The ground of the other appearances of a Prism you may easily collect without any further repetition.

The Sun appears as manifold in the water, as the water is rendered unequal through undulation.

There is no Refraction without a Reflection; wherefore Refraction is erroneously divided into simple and mixt, supposing simple to be a Refraction without a Reflection, which is scarce imaginable.

The eye of man consisting of continued equal crystalline parts as Membranes and Humours, doth not refract Objects reflected upon it, because of the said continuous equality, but in case any of the Humours are discontinued by an interjacent Body, Objects appear double because of the Refraction in the eye happening through the inequality of the said interjacent Body.

A Scheme representing the Derivation of Colours.



CHAP.

CHAP. XXIII.

Of Sounds.

1. *The Definition of a Sound. That the Collision of two solid Bodies is not always necessary for to raise a Sound.*
2. *Whether a Sound be inherent in the Air, or in the body sounding. The manner of Production of a Sound.*
3. *Whether a Sound is propagated through the water intencionally only. That a Sound may be made and heard under water.*
4. *That a Sound is a real pluffing up of the Air. How a Sound is propagated through the Air; and how far. Why a small Sound raised at one end of a Mast or Beam may be easily heard at the other end. Why the Noyse of the treading of a Troop of Horse may be heard at a far distance.*
5. *The difference between a Sound and a Light or Colour. That it is possible for a man to hear with his eyes, and see with his ears; likewise for other Creatures to hear and see by means of their feeling.*
6. *The difference of Sounds. Why the Sound of a Bell or Drum ceaseth assoon as you touch them with your finger. Why an empty Glass causes a greater Sound then if filled with water.*
7. *The Reasons of Concords in Musick.*
8. *The Causes of the variation of Sounds. Why celestial bodies, Rain and Hail do make but little noyse in the Air.*
9. *How Sounds are reflected. How Sounds are intended and remitted.*
10. *The manner of Refraction of Sounds. What an undulating Sound is.*
11. *How a Voyce is formed.*

Sound is a Quality, whereby a natural body moves the Hearing. This is a Formal and Relative Definition of a Sound, because we call that a Sound, which moves the auditory Spirits or internal air of our hearing. Besides this, it hath a fundamental Essence, which is nothing else but a Concussion and Conquassation of the air; or otherwise, it is the air suddenly and violently concussed or conquassated, vibrated or rather plufft up by an extrinseck continuous body, be it hard or soft, liquid or solid, single or double, that is, between two.

In the first place I might here question, whether a soft or liquid body is apt to make a Sound, since *Aristotle* in his 26. *T. de Anima. Chap. 8.* states a Sound to be the percussion or collision of two solid hard bodies, and particularly that soft bodies, as a Sponge, or wool do make no sound.

Notwithstanding this Assertion of *Arist.* which afterwards I shall make appear to be false, I prove that liquid and soft bodies make a sound: Pour water to water, and hearken whether they make no sound; beat one Sponge against another, and listen to their sound; throw one Pack of woollen cloath upon the other, and hearken whether they make no sound.

II. Next let us enquire whether a sound be a quality inherent in the solid bodies, or in the air. Not in the solid bodies, because they give very little sound in a small compass of air, and consequently none without air. Wherefore it must rather inhere in the air. I prove it, a sound is a Passion, but it is the air that receives this Passion; *ergo* the sound is in the air. The passion is to be krutcht, plust up, or shaken.

2. A sound sometimes is made when the air is immediately plust up by one body, as when we make a noise by switching the air, we hear a sound is made in the air.

The Definition of a sound asserts it to be a violent and sudden concussion; for if you do concuss the air, although pent between two hard bodies, softly and retortedly, it will make no sensible sound, because the air gets out from between them, by pressing gradually upon its adjacent parts without being plust up, or being kept in by them, and so escapes making a noyse. But when it is suddenly and violently pressed upon by one or two bodies, it is forced to pluffe up, because the adjacent air doth not give way fast enough. The air being plust up or concussed, is continued to the ear, by reason that one part pluffes up another, & so the parts of air lying close in continuation one upon the other, are soon plust up & continued to the auditory air, within the ears, which it moves likewise with the same degree and property of pluffing, as the degree of percussion was first made upon it by the property of the percutient. How air is plust up, may easily be apprehended, *viz.* by two bodies suddenly & violently squeezing out the air, which was between them, by their sudden collision against one another: For instance, clap your hands hard together, & you may by the subtil feeling of your face perceive

perceive the air plust up from between them. Or else a pluffing may also be caused by a smart impulsion of the parts of air upon one another by a Stick, Board, or any other single continuous body.

The Reason of a sounds celerity and extent of motion to such an improporcionable distance you may apprehend from the cause of the swiftness of the light's diffusion treated of in the foregoing Chapr. Be withal mark, that Light and diffusion of colours are by far swifter then sounds, because a Flame being a most subtil and forcible body, doth much swifter obtend the air; besides the air doth rather accur in an obtension to prevent its disruption, then recede; whereas in making a sound the air is longer in being obruded or plust away from the percipients, because it retrocedes, and the force percussing doth not compass it circularly from all sides, but adversely only. Hence it is, that at a distance we see a Harcher driven into Wood long before we hear the sound of it; or that we see Lightning before we hear the Thunder.

III. I remember, it is an ordinary doubt moved by the *Peripateticks*, Through what *medium* a sound is deferred to the hearing. Their solution is, that a sound is really deferred through the air, as through a *medium*, but intencionally through the water.

This seems to partake of no small absurdity; for many of them do assert, that a sound is subjectively * in the air; if so, then a sound would be said to be its own *medium*, which is absurd; for a *medium* is ever intended to be a different thing from that, to which it is a *medium* †. Touching their Solution, it is partly false, in that they affirm a sound to be intencionally only deferred through the water: But why more intencionally through the water then through the air? I will first propose an Instance inferring water to be capable of receiving a Sound, and then enquire further into the case. Frogs croaking under the water make a Sound there, which we hear above the water; likewise we hear the Sound of a Pole hitting against a stone under water. Certainly none will deny, but that the Sound of these is really propagated by obruding the air through its bursting upwards; for we see the water plainly burst or pluffe upwards a little before we hear the noyse made by a Frog, or Pole; ergo the action of a Sound is real, as well in or through the water, as through the air. Possibly they may grant me, that the noyse made in the water is a real action, but deny the noyse made in the air and propagated through the water to be real, asserting it to be intencional

only.

* That is inheres in the air like an accident in its substance.

† Whereas an accident and its substance are not really different, as hath been proved in my *Metaph.*

only. I prove it to be reall. A great sound made in the air doth sensibly cause a streame in the water; *ergo*, its action is really continued upon the water. But again, a sound being made in the air, its action is much ob- used, because of the impropotion between water being very thick, and air being very thin; so that a great noise in the air will make but a little noise in the water; and a little noise in the air will make no sensible noise in the water. But were this audible quality in the water intentional, then the least sound in the air would be perceptible in the water: But the one is false, *ergo*, the other is false also. That a great sound in the air is audible in the water, yet but very obtusely is testified by duckers or divers under the water; the same is seconded by *Pliny* in his *natural history*, 10. b. 70. Chap. attributing hearing and tasting unto fishes, and relating that fishes have been called together by a certain sound to take their food. *Gellius lib. 16. noct. attic. c. 19.* doth also recite out of *Herodotus*, that *Arion*, being cast over-board by the Sea-men, did through the harmonical sound of his Musick draw the Dolphins to him, whereof one took him upon his back and carried him safe to a Harbor: Supposing this to be but a story, nevertheless the allusion of the famous Inventor witnesses that fishes can hear under the water.

IV. Certainly few will require any proof from me, that a sound is a real concussion or pluffing of the ayr, since there is no great sound but it strikes air, houses and the earth too whereon we stand, and that sometimes to a very great distance. Some years past it hapned that the Magazine of *Delf*, a Town in the Low-countries, was blown up, by an accidental fire lighted upon the gunpowder, the great sound or Concussion of the ayr caused through this blast was extended to many miles, insomuch that it was very perfectly perceived at *Amsterdam*. The same blast forced open one of the windows of the Chamber where an Acquaintance of mine lay then at the *Hague*, with that violence, that its rebounding against the Wall broke most of the panes. At *Dunkirk* the sound raised by blowing up of two or three barrells of Gunpowder killed a boy although at some distance from it; which accident hapned because the Concussion or pluffing of the ayr was continued with that force, that it did in that manner violently concusse or rather disrupt the animal and vital spirits of the boys body, which in a manner are (as I said before) a continuous ayr intermixt with some contiguities of fire and earth.

I have

I have formerly told you, That the propagation of ayr or any quality or effect inherent and impressed in and upon the ayr reaches no further than its continuity is extending, and works only upon other continuous bodies: The reason is, because the same action is continued only upon bodies, which are of the same nature, and which receive that action in the same manner: Wherefore ayr and water being both continuous and united in continuity do receive the effects acted upon their continuities alike and in the same manner, that is to say, as far as they are both continuous, and the effects are acted upon their continuities in a like manner: Saving that the tenuity of the one, and crassitude of the other, doth hinder or facilitate, augment or diminish the said action thus continued from one to the other. Further as much as one is deprived from its continuity by having its body intermixt with contiguous indivisibles, so much there is detracted from the intenseness of the act continued unto it by another continuous body. Thirdly, as the various incidence of light doth alter the face of colours, so doth the various continuation of other various bodies variously qualified in their continuity by having other contiguous bodies intermixt in them alter the property of the sound continued in them. Lastly, since a sound is an effect impressed upon the continuity of the ayr, nothing is more averse to it or drowns it sooner than a contiguous body. By help of these Theorems you may now resolve the node of several difficulties touching sounds.

1. Why doth earth or fire dead a sound more than water, glass, or paper; or why is a sound propagable through water, glass, or paper, and is quite deadened by earth, in a manner that by how much earth or fire * there is contained in a body, by so much a sound is deadened by that body; and by how much water or ayr there is contained in an intermediate body, by so much a sound is propagated further. The reason is, because a propagated sound is nothing else but the vibration of ayr continuously continued upon a continuous body, to which continuity contiguity is contrary. I will explain it to you by a conflagration of water, whereby it is concussioned into streams, these streams so concussioned are propagated into other more remote streams; but if you interpose a board near the central streams, it will hinder the propagation of the same streams, because it doth divide the continuity of water. Even so it is with water, glass, and paper, those being continuous do propagate the ayr quality

* That is
fire not
converted
into a
flame.

quality in as much as they are continuous. But let us dive a little further into this, and question whether the continuity of the thick waterish substance of glass, and of water be the cause of the propagation of this continuity in sounds, or of the ayr admitted within the subtil invisible pores of glasse, or of both: I answer, of both, but of the one primarily and *per se*, of the other secundarily and *per accidens*. First, I prove it is of the thick waterish parts; for a great noise, as perhaps of a Gun, will bend the glass of a window, which glass through its continuity again communicates the same impression to the adjacent ayr.

In little sounds the waterish part of a glass is not moved, but the airy parts contained within it, which propagate the same motion into the next adjacent parts: for it is improbable the motion of every small sound should move so solid a body as that of glass, unless it were the ayr contained within its subtil porosities. Likewise in water it self as it is now, the sound which is propagated through it or from it, is not alwaies the motion of water it self, but of the ayr contained within the water; for it is also improbable that every slight sound should be sufficient to move the weighty body of water: Besides, were it not through the ayr but through the water a sound could not be propagated in so short a space.

The reason, why the sound caused by a soft percussion of the ayr upon one end of a long Beam, or of a Mast, is so readily heard by another applying his ear to the other end of it, is, because that sound is propagated by the percussed ayr flyding down along the Surface of the said Beam or Mast, not because the sound is propagated through the internal continuity of the Beam or Mast; for that were impossible for the sound to reach to the other end through so thick a body in so short a time, or by so gentle a percussion. But were the sound made by the force of a great Hammer, it is not improbable but the sound would pass through the body of it.

The noise of a Troop of Horse marching over a plain hard sandy ground may be heard at a far distance, because the sound is continually propagated by the ayr impelled along the Surface of the earth, there being no contiguous body interposed to dead its sound or interrupt its continuation; for otherwise any length of grass or quantity of corn standing in the fields between the hearers and the horses would interrupt and dead the sound: The same reason may be

be applied to resolve one, why a sound made in the ayr by one upon the water is heard from a further distance, than if made upon the land: because the earth being contiguous doth somewhat dead and interrupt the propagation of a sound; but the water being continuous and smooth doth rather further it, because it doth slide and reflect the sound from her, and so makes it greater and swifter than otherwise it would be if propagated through the ayr alone.

Water attenuated by the ayr makes a real sound to those that are under water, because it concusses the auditory ayr.

V. This pluffing up of ayr in a sound is distinguished from the obtension of it by light, 1. In that in obtensions the ayr moves to the body obtending, whereas in pluffing the ayr moves from the percipient. 2. A pluffing is a more course action, whereas the other is much more subtil; for they are both motions almost of the same kind differing only in tenuity and crassitude: Whence infer, That there is no other difference between the Optick and Auditory spirits or ayr, than that the Optick ayr is by far subtiler, the other more course, both having Membranes to qualifie their Objects. Hence let us examine whether it be possible for a man to see or discern a voice or sound with his eyes, or to hear a colour. A man, who hath all his senses well qualified, if he make trial of the query will bring in his verdict for the impossibility of it. Wherefore let us propose the doubt in a more probable state, to wit, whether a man, whose Optick spirits be thick and his Membranes thin and somewhat denser is capable of perceiving and discerning a voice or sound through his sight. 2. Whether a man, whose Auditory spirits are very thin and Membrane more thick and transparent than ordinary, be capable of perceiving colours and light. I affirm it, and will make it appear to you by experience and reason. I have oft been told that the Constable of *Castile* his brother could perfectly discern sounds and voices by his eyes. How this came to pass I shall easily demonstrate, by considering first the disposition of his ocular Membranes and Optick spirits. The Membranes of his eyes were somewhat thin and course, not overmuch transparent, standing deep in his head. Whence this hapned I do farther explain to you; He was deaf in such a degree, that the greatest Thunder could not be perceived by him when his Eyes were shut. This deafness arose from a total coalition of his Auditory passage, and want of a *Tympanum*. The matter of this Tympanum was converted by the plastick vertue

ture in his formation to the constitution of the membranes of his Eyes, whence the said membranes appeared deadish, course, and skinny; in short, the *Tympanum* of his eare was in a manner transferred to his eyes: His Optick Spirits must then of a necessity be thicker or less thin than ordinary for to be proportionable to that membrane, for all parts of the body are informed with spirits proportionable to their consistency, and in effect their *modus consistentia* is caused from the *modus consistentia spirituum fixorum*. His eyes stood deep in his head, and so thereby framed a grove, wherein the sound was congregated. In fine his eyes, were the greater half eyes, and the less half eares. That all this is agreeable his other acts did testifie; because his sight was imperfect, he could not see at a distance; Objects unless they were great and lustrous could not be perfectly discerned by him; on the other side his hearing through his eyes was by far more imperfect, a moderate sound he did not perceive; a loud sound or voice he was alone sensible of. Since then he was capable of perceiving sounds through his eyes, no wonder if he learned his speech from thence; for speech is nothing else but an echoing of a voice spoken by another and perceived by spirits disposed to receive its impression, by expressing the same impression again by the tongue in the same manner as it was impressed. Now his speech being very imperfect and unequal, did testifie that the voices perceived by his eyes were imperfect and unequal. That it is possible for an Animal to see colours with its eares is evident in a Mole, whose eares not being very deep, but its *Tympanum* somewhat transparent, is thereby disposed to distinguish light from darkeness, and one colour from another; that it perceives colours and light is granted by all, which it cannot do by its eyes; for it hath none, *ergo*, it must be by its eares alone, which as I have shewed are disposed to seeing almost as well as to hearing. But you may object, That Authors do assign eyes to a Mole, which are imagined by them to be in some places upon their heads, where the skin seems somewhat thinner and glabrous. I answer, That this is a great mistake, for were those places destinated for their eyes they would be pervious, which they are not; for underneath the common bone of their head is obducted. Besides this of the Mole I have heard of men, who could discern light by their eares.

Let us still proceed in searching further into the niceties of sounds

sounds and colours, and examine whether it be possible for an animal to perceive colours and sounds by its tact. Certainly yes; for if its Membranes be moderately thin and transparent, and the spirits fixt in them be moderately coarse, questionless it will see colours by its tact. Flies, Fleas, Worms, &c. do perceive colours and light: For Flies in the day time we see they fly to and rest themselves in a definite place, without hitting against any opposite body beyond their aime: Or again, if one goes to catch a Flie, the noise which the hand makes by concussing the air in moving to her, scares the Flie and makes her flee away. The first instance is an example of a flies perceiving colours, objects, and light, which must needs be perceived by her tact, since it hath no other visible eyes, although lookt for in a magnifying glass. The last testifies its perceiving of noise by the tact, because it doth equally perceive it from all parts; but had it ears, it would perceive it more from one part than another. The same is also apparent in Fleas, Worms, and other insects. Fishes, it is certain, hear a sound under water, but not by their ears, for they have none; but by their eyes, which are almost equally disposed to hearing and seeing: More then this, I believe that colours and sounds are smelt and tasted by some Creatures.

VI. The reason, why so many several kinds of objects are perceived by one faculty in some insects, is, because their bodies are so little, that it is impossible *secundum quid* that nature should have destined distinct Organs for the perceiving of each object, and therefore those several faculties are confounded into one.

The difference of sounds is taken from their quantity, which is threefold: Longitude, Latitude, and Profundity. The *Longitude* of a sound is the duration of it. The *Latitude* is its sharpness and smoothness. The *thickness* is its Altitude and Profundity. A sound is said to be long or short from its Longitude. A long sound is a sound continued in length or in the same tone; so holding your finger long upon the key of an Organ, makes it to be long; if you keep down the key but a little while, it makes but a short sound. The cause of a long sound is the keeping the air in the same concussion or pluffing. Hence it is that as long as you keep your finger upon the key of a pair of Virginals the sound doth last, because you keep the air up in one and the same concussion, but as soon as you withdraw your finger, the sound vanisheth presently after; because the

cloth, which is fastned at the top of the Jack, by touching the string doth stay its concussing motion by interrupting its continuity, and by that means the ayr is quieted.

The same reason resolves, why the sound of a Bell, or of a Lute string is shortned or presently deaded as soon as you touch either with your finger: Namely, because the ayr of the Bell being vibrated by a concutient its propagation is shortned and deaded by dividing its continuity, and staying the propagating sounding ayr through interposing a contiguous body, whereby the ayr is relaxed and driven back.

The reason, why sounding upon one side of a Drum, the motion of that sound is prolonged to the other side, is, because the ayr is not stopt by any contiguous body, but holding your finger upon either side the sound is forthwith shortned.

Why is the sound of an empty drinking Glass more prolonged, than if it were filled up with water? because the water being thicker and heavier is not so easily percussed as the ayr.

A sound is said to be smooth or harsh from its crassitude, which depends upon the levor and asperity, equality and inequality of the percutient, and upon its smartness and softness in concussing.

From its profundity and Altitude a sound is termed *base* or *course*, and *treble* or *high*, or equal and unequal; thus they say *la* is high and fine, *ut* course and base. Sounds are termed equal, if they are of the same profundity or altitude, and so *unisons* are called equal; all other intervals of sounds are called unequal, as a *Diapason*, *Diapente*, a *Diatesseron*, a *third*, a *sixt*, and a *second*, &c.

Notwithstanding this inequality and rice, there is between several tones from one to eight a concord observable, which doth very much affect and please the ear; the cause of it hath appeared to be very abstruse to many, which in effect is obvious enough. A *Diapason* strikes a sweet concord, because that distance of tone doth affect the ear; the ear is affected with it, because sounds of that distance move it in such a manner, as that the one sets off the other very much, in the same manner as four sets off a sweet taste, or as a white sets off a black, or a Summers heat of the body is set off by coming between a pair of fine cool sheets; or as the heat & drought, hapning when a man hath made himself hot and dry by running, is much set off by a draught of cool drink. So that you may take notice, that there are extreme Concords belonging to every sense in particular; not only

only so, but you may also observe intermediate Concords between their Objects; as a black Suit is well set off by a pair of Scarlet Hose, and is pleasing to the eye; this is a mediate concord between the extremes, namely white and black, as a *Diapense* is a middle concord to a *Diapason*. A black Suit is a concord to a Pearl-colour Stockin; so is a *Diapason* a Concord to a *Diatessaron*. Moreover there are also Discords in Colours and Objects of other senses, as well as in sounds. As a *Seventh* is a discord to an *Unison*; so is a pair of Brown Mill'd Hose to a black Suit, or a pair of black Hose to a Grey Suit.

In fine, you may perceive as many discords and concords between the objects of all the other Senses, as between Sounds. Hence I infer, that the same Reason, why a pair of black Hose is a Discord to a light Gray suit (for most peoples sight is disaffected with such an opposition) or why Vinegar is a Concord to Sugar (for the Palat is as much affected with their Concord, as the Hearing with a Concord of Sounds) will prove satisfactory to the disquisition upon the cause of Discords and Concords between Sounds. The reason of Concords in Colours is, because such a distance or opposition of colour doth set off another (according to that Maxime, *Contraria juxta se invicem posita magis elucescunt*;) Whereas were this distance but of one degree, it would rather detract from one another, as being defective in setting one another off. So a little sour added to much sweet makes an unpleasant tast. Likewise in Sounds an *Unison* and a *Second* make Discords, because there is too little Treble or altitude in a *Second* to respond to the deep Base of an *Unison*, and hence you may easily conceive the Grounds and Causes of all Concords and Discords. The cause of the different sounds of Trebles and Bases, is the thickness of the String or *percussant* vibrating the air in such a degree of obtuseness, or such a degree of thinness of the String percussing the air acutely: or thus, the Bubble which a course String plucks up must needs be thicker then that of a fine one.

VIII. Sounds vary according to the qualification of the percussant in consistency, bigness and action. A percussant being thick, makes a thick Sound; so the Base String of an Instrument makes a thick or course Sound. A thin percussant beats a thin or sharp sound; hence a small string sounds sharply. So that according to the greater or lesser courseness or thickness, thinness or sharpness of a percussant, the Sound is made more or less course and sharp. The rarity of a percussant

percutient or its density cause little or no noise: if any, a very dumb one, because the air is obtruded by neither of them, but is only percolated through them. A great percutient makes a great noise, a small one little. The percussion of a percutient being continuous, or interrupted, slow or quick, smart or feeble, raises a continuous or interrupted, slow or quick, smart or feeble Noise.

The Heavens, that is, the fiery bodies, moving with a rapid motion through or with their own Region of fire, make some noise, but so little, that it would scarce be audible, supposing a man were near to them. They make some little noise, because they being bodies somewhat continuous, and obtruding that little air, which is admitted to the fire in some measure, they must consequently make a noise, but such as is soon deadened through the contiguity of the fire. Among these Bodies, the Moon makes the greatest noise, because its body is more continuous, & its situation is nearest to the region of the air. Supposing two celestial bodies should extraordinarily meet & dash against one another, they would make an indifferently audible noise, because the peregrine air being thereby more pent, its obtrusion must necessarily be the greater. A *Stella cadens* (or a falling Star) yields no noise, because the air gives way in it self as fast as the other can make way down; but did it fall down swifter then the air could give way, then of necessity it must obtrude it, and raise a sound; or did it fall upon air being pent by it and another Body, it would do the same with more efficacy.

Clouds, Rain and Hail make a small noise in the air, although not very sensible, because the air is loose and free, whereby it giveth way: but where ever it is pent by them and other Bodies, they raise a sound; hence Hail and Rain make a noise, when they shrowd the air between themselves and the earth; hence it is also, why Streams or a Channel of water is not heard, unless where it beats smartly against it self, or against shallows of Gravel or Pebble.

Focal fire glowing or any thing within it, makes no noise in it self, unless its body being rendered more continuous in a flame is beaten against the air, or the air is obtruded against it by another continuous Body; as by a fan or wind out of Bellows.

A hissing noise is made in the air, when it is smartly percussed without being pent by any other Body, but by its own parts and the percutient. Hence it is that a Bullet shot or the switching of the
air

air with a Switch make a hissing noise ; but their noise is much altered, where the air is pent by it and another solid body.

A quaking noise , as of an Earthquake, or the quavering upon an Instrument, proceeds from the interruption & repetition of the percussion. By how much the more the air is pent from all parts, the greater and violenter sound it makes. Hence it is, that the noise of a Gun, or of any thing bursting is of that loudness. This also proves a cause why a soft whispering, or blast of wind makes a great sound improporcionable to so soft a percussion, in a Trunk, or any other close, round long passage. Hence a Trumper, or a Hunters Horn do make so great a noise, and is so far propagated.

IX. A sound is either *reflexe* or *refracted*. A reflexe sound is, when it is propelled against a continuous body, by which it is repulsed, or whence it doth rebound ; so that the reflection of a Sound is nothing else, but a rebounding of it from a continuous body.

Sounds acquire an increase or a lower noise from their rebounding, in a like manner as Light is intended by its reflection. The greater this reflection is, the greater noise it makes. The greatest Reflection is, when a Sound is reflected by a circular reflecting continuous body ; because the sound being circularly propagated, (for a noise made in the open air is heard round about) is equally reflected from all parts ; and its parts do as it were reflect back again against one another, whereby the sound is majorated to its greatest intention. Hence it is that Chappels being circularly roofed reflect a great Sound, and were their Bottom also circular, the sound would be by far more intended. By the way, take notice that an *Eccho* is not a reflection alone of a sound, neither is it caused by it alone ; for all grant, that there is a great reflection of a Sound in Chappels, and yet there is no *Eccho*.

All sorts of Metals formed into a Concave, as Pels, Bowls made of metal, & all sorts of drinking Glasses give a great sound (for their ringing noise is nothing else, but a great intended reflexe quaking noise) because the percussed sound is reflect circularly within upon the continued parts of the said Metals & Glasses: From the same reason it is, that all hollow continued bodies, as most sorts of Instruments, *viz.* Virginals, Viols, Lutes, &c. make so great and improporcionable a sound, to so small a percussion. A man would imagine, that the sound caused by striking of a String of an Instrument, should come all from within the Instrument, and that there were no sound at all above ;

above; but it is otherwise: 'Tis true, the greater sound is protruded from within; nevertheless there is a sound also without, but it being the lesser, is overcome and drowned by the protrusion of the greater sound from within. This is evident in a Metal being struck or sounded in an upper Chamber, sometimes happening to make a greater sound in the next Room underneath it, (provided that the lower Room be more concave, and that the Metal do stand upon the Boards) but notwithstanding there is some little sound in the same Room above.

As a sound is majorated by these forementioned occasions, so it may also be minorated by their contraries.

Besides all this, there is also a contraction or abbreviation of a Sound, whereby the *Species* of a great sound is fully perceived, collected and contracted into a small space; and this is only possible in long hollow Passages and Pipes, and often the longer they are, the more and plainer the sound is contracted, provided that their length is not too far extending: Hence it is, why the *Species* of a great sound is contracted and plainly perceived by the ear, and is yet more and plainer contracted, when a man holds his hand being inverted like a Trunk before it. The *Noti* of this Theorem is the same with the *Noti* of the contraction of a visible Object upon a Rotundity.

As a remote visible Object can be rendered more visible by the help of magnifying Glasses, so can a remote audible Object be rendered more audible by majorating or contracting Instruments, as Sarabanes, or long Trunks, &c.

Refraction of a Sound is, when it is reflected upon several Cavities or continuous concaves. Wherefore every concave contracting the sound in a determinate *Species*, there must necessarily be as many sounds reflected and rendered, as there are perfect Cavities; this is otherwise called the Ecchoing or resonance of Sounds. Compare this with the refraction of Light and Colours, the Reasons of both being the same.

An undulating sound is an imperfect Refraction, and is when a sound is but half ecchoed or resounded, arising from the imperfection and obtuseness of the Cavity; for the sides of a perfect Cavity are required to be acute for to divide the Sound from its next cavity, or for to make a compleat Refraction. This resonance of Sounds doth only rebound to a certain distance and determinate Sphere, within which

compass

compass if the ear be seated, it may hear the Eccho. The Sound being propagated circularly may be ecchoed all about the Circumference; wherefore two men standing in several places may each hear a distinct and several Eccho of one and the same Sound, and according to the difference of the Situation of the Cavities, the one shall perceive the Eccho, and the other shall not.

Many do imagine that the multiplicity of Resonances in Sounds is caused by an Eccho upon an Eccho; but erroneously, it being rather to be imputed to the diversity and multiplicity of perfect Cavities; which although it be not impossible, yet it happens very seldom. In many pillared round Churches a loud voice doth resonate by several Eccho's near upon at the same time, which if it happened through an Eccho upon an Eccho, their motion would be much slower one after the other. The same is perceptible among some Hills, whose several Vallies being perfect cavities, sometimes make a multiplicity of Eccho's. The reason, why one Eccho is frequently heard after the other, is, because of the greater remoteness of the Cavities, which greater remoteness is also the cause of the minoration of the sound. The Chappel at *Pont Charenton* refracts or eccho's a Sound sixteen times, which is caused through sixteen perfect Cavities constituted by the two Rowes of Pillars built of each side of the said Chappel.

We read also of the seven times answering Eccho of the Gallery of *Olympia*, a City in *Greece*, and thence was called *Heptaphonos*, or returning seven voyces; which was effected through the refraction of the Sound between the Pillars. There was also a famous Eccho within *Cyzecum* a City of *Birthynia*, returning a Sound many times. *Lucretius* in *Lib. 4.* speaks of another Eccho, which multiplied a voice seven times.

*Sex etiam aut septem loca vidi reddere voces,
Undam cum faceres. —*

XI. Hitherto hath been discoursed on natural Sounds, it remains I should add a word or two touching Animal sounds or voices; which are either inarticulate, as such as are common to Beasts and Men; or articulate, which in their perfection are only proper to men. The articulation is nothing else but a continued unequal Sound, being moderated in Longitude, Latitude and Profundity, through the help of the Lungs, Throat, Tongue, Palate, Lips and Teeth: all these serve to pent and screw the air according to any intended modulation. If the throat be very hollow, and that the *Uvula* be wanting, the Sound reflecting against that imperfect Hollowness makes

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its voice hollow and loud. There cannot be any sensible eccho of the voyce within the mouth, although a perfect hollownes were supposed to be there, because there must be allowed a proportionable distance, otherwise a sound must rebound again into and against it self, whereby its ecchoing is drowned; this is the reason, why a voyce or sound doth not eccho, when it is made too near to a perfect Cavity.

We will shut up this Discourse of Audibles with the mentioning of one absurd Question generally moved by the *Peripatet. viz.* Whether a sound can be made in a *vacuum*, that is, where there is no air, they conceiving that a sound is made immediately by the percussion of two solid bodies one against the other: the Absurdity is obvious, since it hath so evidently been demonstrated that sound is nothing but a passion of the Air.

CHAP. XXIV.

Of Tasts, Smels and Tangibles.

1. *The Definition of a Tast. The Difference between the Tasting and Hearing Faculty. The manner of a tasts Action and Passion.*
2. *The Differences of Tasts. Whether tasts are not communicable through a medium.*
3. *What a Smell is. The manner of a Sents action and passion.*
4. *Whether Sents be Nutritive. How many have been kept alive without Eating or Drinking. How Sents revive one in a Swoun. The distance requisite in Sents from the Faculty. That the Sent of Excrements smels sweet to a Dog. How a Dog sents a Bitch at a great distance. The manner of a Dogs winding the Sent of a Hare. That Fishes do sent by means of their Gills or Palate.*
5. *The causes of a sweet Smell. Why most Beasts are pleased with the Smell of a Panther. What a stinking Smell is. The other kinds of Sents. Whether the Plague gives a Smell, and whether perceptible by a man. Whether it be possible to poyson one by a Perfume of Gloves, or of a Letter.*
6. *What the Tact is, and the manner of its sensation.*
7. *The differences of tangible qualities. Whether Titillation be distinguished from the ordinary tact. Whether man hath the most exquisite tact.*
8. *What*

3. *What a tangible quality is. The causes of pleasing Tangibles. Why a Kiss feels pleasing to ones lips. That a Dog takes delight in kissing. What Pain is, and its cause of Titillation. Why ones proper feeling doth not tickle, but anothers doth.*

I. **A** Tast (*Sapor*) is a quality, whereby a mixt being moveth the tasting faculty.

The tasting Faculty is inherent immediately in the fixt animal spirits, and mediately in the influent ones of the Tongue and Palat. These Spirits are in two degrees thicker then the auditory spirits, there being the olfactive spirits intercedent, differing but one degree in thickness from the said auditory spirits.

The object of this faculty is required to be respondent to it in consistency; wherefore the faculty, *viz.* the Spirits being dense and thick, the Objects of the tast do move the same faculty by a greater density and thickness then those of visibles and audibles. Otherwise if the Object be thinner and rarer then is requisite, it is incapable of moving the tast; hence it is, that we cannot tast air, or warmth proceeding from fire. That, which is thick, moves the tast by a kind of continuous compression of the spirits in the tongue: thus fair water affects the tast, which the more ayry and thin it is affects the tongue the more. Water being tempered with Spirits, makes a kind of a sharp and brisk tast; for instance, Wine. Dense bodies move the Palat by a contiguous compression, and therefore make a more distinct and forcible tast. Summarily, tast is nothing else but the discerning of the several temperatures of mixt bodies effecting several passions in the tongue and upon its gustative faculty, which several passions are said to be several tastes. Hence it is also obvious that the quality, whereby a tast moves the gustative faculty, is nothing but its action, whereby it acteth distinctly in several Subjects, wherein a different gustable quality is inherent.

Since the Gustative Spirits are deeply latent within a porous and Spongie body, nothing can move the tast, unless it be of that thinness or small quantity, as that it may pass the pores of the tongue, the passing of which subtilities waterish Moysture doth very much facilitate, which proves in stead of a Vehicle to them, and makes those passages slippery. Hence it is, that no great bodies have any tast, unless they be first attrited and diminishd by the teeth, and the more they be diminishd, the more their tast becomes perceptible.

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Dry

Dry bodies are not so gustable as when they are a little moistened, whereby they reiterate the pores of the tongue and procure a passage to the seat of the taste.

II. As many different waies as objects move the taste, or cause severall passions in it, so many different tastes there be. That, which doth only gently shake the taste, and as it were doth but tickle it, is sweet, and deriving from a temperateness, yet so as that water is abounding in it. That, which doth sensibly alterate the taste, is an intermediate sapour; that, which doth most alterate it, so as it may not pervert the faculty, is an extream sapour. Extreme sapours depend upon the greatest predominance of each Element in a several mixt body, which being four do also constitute four extreme tastes.

1. A fiery hot taste, as in Pepper, Ginger, &c. 2. An earthy taste. 3. A waterish taste. 4. An ayry tast, not such as *Theophrastus* calls a fat taste, like there is in oyl. The rest are intermediate, as bitter, acerb, acid, and salt, for that is a tast mixt out of a waterish and ayry tast.

Peripateticks assert, that tastes for to move the gustable faculty are to be immediately applyed to it; and there they assert, that tastes are only real among all the sensible qualities. But this doth not alwaies hold true; for tastes may be communicable through a medium, (and if the air is at any time to be allowed to be a medium, it is sometimes in tastes, and alwaies in odors) to wit, the air, as Apothecaries do all testifie; for when they are powdering, or a peeling of *Colocynthis*, its bitter taste doth very sensibly reach their tongue.

III. A smell or scent is a quality or action, whereby a mixt body moves the olfactive faculty. The difference between this and the gustable faculty is none other, but that the one consists in a degree of a finer and thinner consistency of spirituous air; and the same difference is between their objects, viz. a taste is of a thicker body than a scent, in manner that the scent is too subtil to strike the gustable faculty, and a sapour is too thick to strike the olfactive faculty; wherefore that, which through its subtility passeth the sence of taste doth thereby reach to the sence of smelling, moving its faculty withal. It is then apparent; That the objects of both these senses are the same, differing only in subtilty of body, and that they are nothing but temperaments of bodies comminuted and moving the said powers immediately, yet not so, but that the subtiler parts for to move the sence, are requisite to be separated from the coarser,

fer, and more then that, each needs a Vehicle or a *medium* for to be carried and directed through the subtil passages to the deep latent sensory. The vehicle of tastes is water (to which spittle and drink are equipollent,) as being through its thickness respondable to receive so thick and course an object; a thinner vehicle, as the air, could not receive it, because it is too thin to support it. The vehicle of scents is air, as being through its thinness proportionated to receive and convey such subtil bodies; were this vehicle thicker, it would through its gravity expel or expresse bodies of that subtilty, that smells are of. You may here observe the depravate Judgments of the Peripateticks concerning the *mediums* of sensible objects, where they ought to grant a *medium* as to scents and tastes, they withhold it, where they should allow no *medium*, there they grant it; as to audibles and visibles. I stated temperaments of bodies to be the objects of sense, by which you are to understand the subtilter and volatrick parts of substances reduced to a certain degree of temperament, and obtaining certain vertues of acting: So that hereby I do not intend any quality distinct from a substance for the objects of sense; but real bodies so qualified as to move sense; where (mark) qualities are not really distinguished from their bodies, but really identified with them in the concrete (although in the abstract they are distinguished *ratione*;) for what is a quality in a body else but a body qualified? Wherefore the action performed through the quality of a body is not to be taken as if the body were one thing, and the quality another, but as one, and that action proceeds from the body qualified; of this I have discoursed more at large in my *Metaphysics*.

IV. *Smells* do nourish no more than tastes nourish the animal spirits; none doubts but that neither nourishes the solid or humoral parts, because of their unsutableness in consistency and temperament. Wherefore although some are said to have sustained their life for a long time through smells alone, as it is recorded of *Democrius*, who sustained his life three daies through the smell of hot bread; and of others, who are said to have lived many daies upon the sent of Tobacco chewed, or smoaked, yet this is not to be understood as if their parts had been really nourished, for they grew leaner and leaner; but their life was maintained by keeping the spirits alive, which is performed by scents, that do gently stir them, as hot bread, rose water, &c. As for Tobacco, that maintains life accidentally

cidentally also, by taking away the sharpness of the hungry spirits knowing upon the stomach, and obtruding and thickning them through its sulphurioufness, and by attracting flegme to the stomach from the head and other parts, which the stomach in time of need turns into nutriment; yet some question, whether they do not nourish the animal and vital spirits, since they are so apt to revive the spirits in faintness and other weakneses. I grant they revive the spirits, but whether this hapneth through stirring up of the spirits, or through nourishing or increasing them may be doubted. Certainly, not by increasing of the spirits, because that smells are crude exhalations, differing from the vital and animal spirits; wherefore they ought first to be concocted and fitted for assimilation by gradual elaborations of the Stomack, Liver, and Heart, and must be purified through the same members from their fuliginous excrements. Who would say, that the spirits of Vinegar should revive through nourishing the spirits, and not through their exciting or irritating of the said spirits? Certainly, such sharp spirits do decline from a capacity of nourishing the spirits of the brain, but nevertheless are very fit to revive by stirring and moving of them: In a like manner do pinching and rubbing of the skin revive in a swoon, not by nourishing of the spirits, but by moving and stirring of them up. Likewise crying loud into the ears, and holding a bright light to the eyes opened by force, doth as soon revive and recal swooning patients as any thing; but assuredly the working of these is by exciting and stirring the spirits, and not by nourishing of them.

The more thin the olfactive Membranes and nerves are, and the more subtil the spirituous olfactive air is, the further odours or scents are perceived: But then it is requisite, that those objects, which are to move such a sense should be more subtil, because of being proportionated to the faculty: for if they are coarse, they will exceed the perception of such a scent; hence it is, that those, who excell all others in exquisiteness of scent cannot attain to the smelling a thick smell near by, unless they go so far off as that those thick exhalations by moving through the air may be grinded less, and so be the better fitted for to strike the olfactive faculty: hence it is then that a Vulture being blinded and placed suddenly in a Room where dead stinking flesh is, shall not find it through his sent, although his smelling is the most exquisite of any living creature (according to the usual Verse:

*Nos aper audire, linx visu, simia gustu,
Vultur odoratu præcellit, aranea tactu.*

A Boar in hearing, a Linx in sight, a Vulture in his smell.
An Ape in taste, a Spider in feeling do us far excell.)

Because the scents being thick are not thin enough to strike his subtil smell; but then again, he shall perceive those scents at the greatest distance, where these thick scents are so much subtiliated through the length of passage, that there he perceives them very sensibly, as being fitted to his scent. The smell of a Tallow-Chandlers shop doth little offend or move our olfactive power, when we are in the shop, yea, not at all, but at our first approach before we come near to it, the smell may direct any one thither blindfold. Neither do Dogs or Hogs smell thick scents, as of excrements or other rotten stinking smells of corrupted flesh, when they are near to them; for did they, they would certainly abhor them; yet it is certain they smell them at a great distance, but then that smell at a distance is not a stinking smell to them, but sweet and pleasant, for otherwise they would not be so much inticed by them; for although such objects stunk near by, through their thick pernicious and strong motion, yet through the grinding of the air they are mollified, and their putrid temperature is laid and equalized, and their stink is quite taken away: this appears in Musk, Civer, or Ambergreece, which if held close to the Nostrils strike as unpleasant a stink as excrements; but again how fragrant and sweet a scent do they emit at a distance? Even so it is with the scent of Excrements to Dogs and Hogs. A Dog scents a Bitch a great way off, although lockt up, without seeing of her, and apprehends the scent under her Tayl to be no ill scent: Wherefore I say, That in many, if not in most scents, that, which smells sweet to a man, scents stinking to most beasts, and that, which scents stinking to us, smells sweet to most beasts. It will not be difficult now to give a reason, why and how a Dog winds the scent of a Hare at so great a distance; it is, because there are some exhalations or evaporations emanated through the habit of a Hares body, and especially of her belly and *inguina*, inhering in the ground and in the air near about it, over which the Hare hath taken her flight, the which although

though they be very subtil & thin, yet they do sensibly and perfectly move the olfactive power of the Dog: this sent is as intirely pleasing to the Dog as the sight of his eagerness in pursuit pleases the Hunters, and so they are both equally inticed to the pursuit of the Hare.

Fishes are said by *Aristotle Lib. 4. de histor. animal.* to have a smell, in that they are inticed by the smell of food cast to them into the water. I do wonder, where he found out their Organ of smelling, for my part I could never discern it, nor any body else. It is true, Fish doth perceive the taste of food through its continuous dissolution through the water by their Gills or Pallate, at a great distance (because the particles of the food are diducted into a large extent) which * being the more exquisite do serve them for to taste and to smell.

* viz. The
pallate and
gills.

V. That, which doth gently shake or move our olfactive air, is only that, which we call a sweet smell, and therein the sent of man is much pleased. Wherefore sent being of a different temperature, all smells do not equally please all men; or every Creature is most pleased in different objects: So most beasts, as *Theophrastus* writes, are pleased with the smell of a Panther, and therefore do all follow him. Cats are delighted by the smell of a Mouse or a Rat, which she ketches in the dark more through guide of her sent, (she having a most exquisite sent as appears by her finding the Larder, or victuals hidden in any part of the house or room) than of her sight. Flies are delighted in the sent, or rather taste (for they have no organ particularly destined for smells,) of honey.

That, which doth most offend and almost pervert our sent, is a stinking smell. This offence of sent is various in degrees according to the degrees of the ingrate motion of smells, and thence according to the property of those degrees, we specify and distinguish smells, whose kinds are named by the same names that tastes are, as being consentaneous to them not only in the thing it self, but also in name: viz. they are either fiery sharp as Pepper, bitter, salt, acid or sour, acerbous, putrid, which subvert and offend the sent, and are various according to the subject, whence they are emitted, and do receive their names also thence, so we say it smells like a carrion, like excrements, like piss, like stinking fish, like rank meat; it smells as if it were musty, &c.

As several scents are offensive to man, so are beasts offended with

with several fents, which they do naturally flee, because they are dissentaneous to their olfactive faculty. So Flies are offended with the smoak of Brimstone (rather I suppose because it choaks them;) Serpents with the sent of *Galbanum*, and Mice with the sent of an Asses claw burnt.

Some people will say, That the Plague doth oft carry a sent with it not unlike to the smell of a mellow apple, or according to others like the scent of May flowers. It is certain that infected houses do smell so, because they are moist and dampish, and thence putrid, and therefore the fitter to receive the venome of pestilent air, but it is not a sent, which the Plague brings along with it, but which it finds in the house; for I have oft smelt such scents in garden houses, which proceeded from the dampness of the boards. The Plague is so subtil a venome, that it passeth the grosseness of mans sent, and therefore cannot be smelt; nevertheless it is sented by Dogs, Cats, Flies, and other creatures, which are so much offended by it, that they usually flee such houses. I have been in several Towns, where the Plague did rage very violently, but when ever I was occasioned to go into strange houses, I generally took notice whether there were any Dog or Cat in the house, or whether I could see any Flies about the Room, which if I did I was the better satisfied. Let me tell you, could the Plague be sented by man, the Plague would be no plague; for as I told you, That which doth move our sent must be of a certain essential thicknes, which, if concomitant to the venome of the Plague, were impossible that it should work such pernicious and potent effects, unless it were of so subtil a body, that it should flee our sent. Hence I do also infer, that it is impossible for a man to be poysoned through a sent; because if a thing be so thick as to move our sent, it is impossible it should produce such an effect in that thicknes. Probably you may object, that the Italians have attained to a way of poisoning men by the smell of perfumed Gloves, or by a sent impressed upon the inside of a Letter, which if a man do open, and receive the sent of it through his nostrils, it will certainly kill him. In the first place it is doubtful, whether they have attained to that perfection of cowardly murder through fents; if they have nor, questionless their *Genius* doth lead enough that way, & it is more for want of industry, knowledge, and skill, than inclination; however it being possible enough, and supposing it to be so, I answer, That it is not the smell doth kill

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a man

a man, but something, which being of that subtilty that it fleeth the sent, is mixed with some perfume, wherewith the fore-mentioned gloves are perfumed: The like answer doth dissolve the objection of payson contained within the Letter.

VI. The courtest of all the senses is the Ta&t, or feeling faculty, to which the courtest kind of objects without any comminution are appropriated: So that the courter an object is the more tangible it proves: This must also be applied immediately to the organ, because no *medium* is course enough to carry or convey it to the sensory. Had the Peripatericks proposed that question here, which they moved concerning seeing and hearing, *viz.* Whether we are capable of sensation in a *vacuum*, they would have shewed themselves to have had some skill in the matter: But let us referre the same question to the sense of feeling, and question, Whether it be possible to feel a thing in a *Vacuum*. I answer affirmatively, What should hinder the Ta&t from feeling, supposing the object to be applied to the sensory? For it needs no air for its vehicle.

VII. *Themistius, Averrboes, Egidius, Fandannus, Apollinaris, Marcellus, Avicenna, Alberius Magnus, Cardan,* and others do seem to state as many different kinds of feeling, as there are different objects, that do move the Ta&t differently, according to which rule they may allow almost infinite kinds of feeling. Their mistake is gross; for according to the same rule, there should be as many kinds of seeing, hearing, &c. but this is absurd. The case is this: It is not every distinct act or object, which, causes a difference in the faculty, for one faculty may perceive many different kinds of objects, and yet not be multiplied in its faculty, but remain one and the same: look in my first book of *Phil.* and in the *Metaph.* where I have insisted more largely upon this point, and illustrated how a faculty may be one formally, and manifold materially.

Scaliger Exerc. CCCXXXVI. d. 3. is so much taken with his Venereal Titillation, that he honoureth it with the name of a sixth sense. Alas his subtilty could hardly reach to maintain the dignity of it. What? Because it pleased his phansie, therefore it must be called a sixth sense. Or did he specifie it from the common ta&t, because it was proper to the Membranes of the Genitals? then upon the same account the ta&t of his head is specifically distinguished from the ta&t of his knee: or is it, because it is a titillation? No certainly, for every sensible part of the body may be tickled; but

but the subtiler the part is, the more exquisite, acute, and piercing the titillation is, and therefore no wonder, if those parts being circumvested with thin membranes, being of a most exquisite sense, perceive so acute and piercing a titillation.

Man is generally cried up to have the most exquisite tact of all Creatures; but why should he be said to be only excellent in feeling and not in all his other senses? For he judges more distinctly of all sensibles, than other creatures, although he doth not perceive them at such a distance as other animals, the excellency of sensation not consisting in remoteness of its action.

VIII. *Tangibility* then is a quality, whereby a mixt body moves the Tact. The principality of the tact consists in a thick course spiritous air, the moving of which is the raising of a feeling. It is moved by being diducted either by depression or weight, or any other thick continuous diduction: So that whatever is thin, light, or rare doth effuge the sense of the tact; hence it is, that the air, thin vapours, exhalations, or spirits, are not immediately felt. That which doth gently stir & quaver these tangent spirits is said to feel pleasing and delightful: Hence it is that kissing seems to feel so pleasing to many, because that hapning to a thin part, being withal of an exquisite feeling, where the spirits being gently stirred and quavered by the application of other lips doth cause a delightful feeling. That this is so, is testified by most, who kiss for a delight, in that they do at that instant of the application of lips feel a creeping quaking spirit in their lips. The same delightful feeling happens also to a Dog, applying his chops to a Bitches taile. A soft object doth gently stir the tangent spirits of the extremities of the fingers, and is perfectly pleasing, and therefore many men love to handle and feel boys and girls cheeks.

That, which doth so much diduct the tactile spirits as to divide and burst them, doth subvert the tact and causes a pain. As for the other differences of tangibles, they are taken from the degree and property of raising feeling in tangibles; so we say, a thing feels heavy, light, hot, cold, moist, dry, fiery, waterish, earthy, hard, soft, rough, smooth, &c. the description of all which I do omit, as having set them down above.

A gentle titillation is one of the delightful tangibles, which gentleness, if otherwise exceeding and inferring violence, doth become painful; as appears in the French scab or manginess. Titillation

sometimes infers violence, not by dividing the tangent spirits through it self and immediately, but by accident through gathering the spirits too much together through its light appulse, to which they do accure in great quantity, and oft do as it were thereby overstrain or overreach themselves.

It seldom happens, that ones proper feeling doth tickle any part of his body, as his knee, or palm of the hand: But if another do gently touch it, it tickles him: the reason is, because that, which toucheth a part must be of a certain distant temperament from the part felt, which is not in a mans own self, but in every other man; besides ones fanſie adds much to it.

Natural



Natural Philosophy.

THE SECOND PART.

The Second Book.

CHAP. I.

Of the Commerce of the Earth with the other Elements.

1. *The Authors purpose touching his Method in the Preceding Book, and a further Explication of some terms made use of there.*
2. *That the Earth is the Center of the world. Copernicus his Astronomy examined.*
3. *The Earths Division into three Regions, and their particular extent.*
4. *What Bodies are generated in the third Region of the Earth; and the manner of their Production. That the Coldness of the Earth is the principal efficient of Stones and Metals. How a Stone is generated in the Kidneyes and in the Bladder. A rare Instance of a Stone taken out of the Bladder. The generation of a Flint, Marble, Jasper, Cornelian, Diamond, Ruby, Gold, Copper, Iron, Mercury, Silver. The places of Mines.*

5. Of

5. Of the transmutation of Metals. Whether Silver be transmutable into Gold. Whether Gold may be rendered potable. The Effects of the supposed Aurum potable, and what it is.
6. Of earthy Salty Juices. The Generation of Common Salt, Salt-Gemme, Saltpeter, Allom, Salt-Armoniack and Vitriol, and of their kinds.
7. Of earthy unctuous Juices, viz. Sulphur, Arsenick, Amber, Naptha, Peteroyl, Asphaltos, Oyl of Earth, Sea-coal and Jeatstone; of their kinds and vertues.
8. Of the mean Juices of the Earth, viz. Mercury, Antimony, Marcasita, Cobaltum, Chalcitis, Misy and Sory. Whether any of these mean Juices are to be stated Principles of Metals.



Therto I have discoursed of the Elements, their Production, Forms, Second and Third, Single and Mixt Qualities, with intention to have declared their Dissolution from the *Chaos*, and separation from one another, and therefore I did only mention so much touching their nature, as might suffice to discover the reason and causes of their effects produced by them through their dissolution. At that time and place I thought it unseasonable to demonstrate the causes of their only apparent contrary motions and effects, whereby they return to one another, and exercise a mutual commerce between each other, and seem (but really do not) to change into one anothers Nature, all which together, with the particular relation of each Element, as they are consisting at present, of local motion in general, and in particular of Attraction and Repulsion, and of Meteors, I shall endeavour to propose to you by a sensible Demonstration. Why I judged it unseasonable to treat of these Particulars above, was because I would not oppress your Phansie with seeming contrary Notions (but really agreeing to a hair,) and so might have endangered the Conception, and Retention of the precedent ones, which now I may with more safety attempt, supposing you to have weighed the Reasons, and to have narrowly searcht into their meaning. Neither shall I repeat any thing of what hath been set down already, but proceed where I left off; only since now I may with security discover my meaning of these Expressions of moving from the Center to the Circumference, and to the Center from
the

the Circumference, both which I have hitherto made use of for to perduce you to a true apprehension of the *Chaos* and its dissolution. By moving from the Center to the Circumference was not intended a deserting of the proper Center of those Elements that were said so to move, but,

1. To move so from their Center as to tend and be diffused thence to the Circumference into the greatest tenuity or rarity, but not to desert their proper Center; for then they could not move at all, because all motions are peracted upon an immoveable, which must be a Center.

2. To move from the circumference to the center, is not to desert the circumference, & be reduced by penetration into a central point (as Mathematicians do imagine,) but to be contracted to a Center from a circumference for to gain the greatest dense weight or weightiness; and that naturally, for density or crassitude cannot be attained by any other manner then by a contraction to a Center; and rarity and tenuity but by a diffusion from a Center.

3. Intending by moving from a Center to a Circumference to signify a tendency to the greatest contiguous rarity or continuous levity, I do not exclude but that such light Elements in a confusion with opposite Elements as it happened in the *Chaos*, may also tend from a Center of Magnitude, because they are expelled by the overpowering weighty Elements expelling them from their Center, and so in this signification I have sometimes intended by moving from the Center a deserting of the Center of Magnitude, or sometimes of the universal Center.

4. None but the whole body of the Elements do tend to, or strive for the universal Center; but particular or mixt bodies for their own particular Center, as you may read further in the Chapter of Local Motions.

II. The earth is, and must necessarily be the Center of the world, or of all the other Elements, within which it is contained like the Yelk of an Egge within the White and the Shell. I prove the Proposition: If the nature of Earth be to move conically from the Circumference to its own Center through a contiguous gravity, and the nature of Air & Fire be to be equally diffused from the center through their levity; ergo the earth must needs fall to the midst of them all, its parts tending circularly and conically to their Center.

ter. The earth being arrived to the center, it resteth quiet and unmoveable: the Reason you shall know by and by. Return back to the explanation of the manner of the dissolution of the *Chaos*, which cannot but demonstrate the evidence of this Point to you.

Nevertheless let us consider that old Phansie of *Pythagoras*, *Plato*, *Aristarchus*, *Seleucus*, *Niceta*, and others upon this Matter, revived by *Copernicus* in the preceding Centenary, and weigh its probability.

1. He imagineth the fixed Stars and their Region to be the extremity of the world, and both to be immoveable.

2. That the Figure of that Region doth appear to us to be circular, but for what we know, our Sense may be deceived.

3. That the Sun is the Center of the aspectable world, being immoveable as to its external place; notwithstanding since through help of the *Telescopium* is observed by the discerning of the motion of its Spots to charge his face about (although still remaining in the same external place) its own *Axis* in 27 daies.

4. Between these two immoveables the Planets are said to move, and among them, *viz.* between *Mars* and *Venus*, the Earth is imagined as a Planet to move about the Sun, and to absolve her Circuit in twelve Monerhs.

* Or a perspective-Glass first invented some 40 or 50 years ago by *Jacobus Metius* of *Almaer*, although accidentally by holding one piece of glass before another to his eye, whereof the nearest was somewhat thicker than the other.

5. That the Moon is seated between the Earth and *Venus*, and is thought to move through its own particular motion about the earth between that space, which there is granted to be between her and *Venus*, and between her and *Mars*: Besides the Moon doth also move with the Earth, as if she were her Page, about the Sun, absolving her course much about the same time. In like manner are the four Stars first discovered through a *Telescopium* * by *Galilaeus*, said to follow the motion of *Jupiter*, and to move with it about the Sun in twelve years, there being besides another motion ascribed to them, whereby they move about the Same *Jupiter* between the space which is between it and *Saturn*, and between it and *Mars*; the innermost whereof absolves its course about it in a day and a quarter; the next in three daies and a half; the third in three daies and four houres; the last in sixteen daies and eight houres: besides these, they have found out by the help of the said *Telescopium* Stars, which are Concomitants to each Planet.

6. That the space between *Saturn* and the fixed Stars is almost immense.

That

That the Region of the fixed stars is immoveable, he takes for granted without giving any probable proof for it; for which notwithstanding may be urged (*Omne mobile fit super immobili*) that all moveables do move upon an immoveable; which if granted, doth not inferre that therefore the Region of the fixed starres must be immoveable, since he hath stated one immoveable already, namely, the Sunne; what need is there then of more? Further, if we do grant two universal immoveables, we must also grant two universal contrary motions; whereof the one is moved upon one immoveable, the other upon the second; but the universal diurnal motion of the stars we see is one and the same; *ergo* but one universal immoveable is necessary. Lastly, He cannot prove it by any sense, only that it must be so, because it agrees with his supposition, and what proof is that to another? The holy words in *Eccles.* do further disprove his position; where it is said that *God moved the Heavens about within the compass of his Glory*. His second Position denotes him no great Naturalist.

The third Position infers the Sun to be the immoveable Center of the world.

1. This doth manifestly contradict Scripture, which doth oft make mention of the Suns rising and going down: And in *Isaiah* 38.8. the Sun is said to have *returned ten degrees back*. And in another place, *Let not the Sun move against Galbaon*.

2. The Sun is accounted by most, and proved by us to be a fiery body, or a flame, and therefore is incapable of attaining to rest in a restless Region, which if it did, its flame would soon diminish through the continual rushing by of the fiery Element tearing its flames into a thousand parts, whose effects would certainly prove destructive to the whole Universe, but especially to all living Creatures.

3. Were the Sun immoveable, and enjoying its rest; *ergo* that rest must either be a violent detention, or a natural rest; not the first, because that could not be durable; or what can there be thought potent enough to detain that vast and most powerful body of the Sun? for that must also be sensibly demonstrated and cleared, otherwise you do nothing. Neither can it be the latter; for were it natural, it must not only have a natural principle of rest, but also be contained in a *vacuum*, or else in a Region whose parts have likewise attained

tained to a natural rest through the enjoying of their Center. It is a property of a Center to be as a point in comparison to the Circumference; but nothing can be contracted to a point but Earth and water, as I have shewed above; whereas according to their own confession the Sun is a vast great body, and its Beams spreading and dilating; *ergo* it must be only Earth and Water. Now what sign of predominance of Earth and Water is there apparent in the Sun? for were it so, the Sun would shew black, and give no light.

The Moon is liker (if any) to be the Center, it consisting by far of more earth then the Sun, as her minority in body, motion and degree of brightness do testify.

Lastly, Is it not more probable that our sight should hallucinate, or be deceived in judging the Sun not to move, then in judging it to move, all Astronomical *Phænomena's* being so consentaneous to this latter Judgment? Besides, how is it possible for us to judge, whether the Sun doth move or rest, since that according to this supposition we are carried about with that swiftness? By the same reason we may doubt of the motion of all the other Planets.

The fourth Position concludes a most rapid motion of the earth. What principle of motion can the earth consist of? Of none certainly, but of fire and air, which are admitted into her body in so disproportionable a measure, that they cannot be thought to impel the earth to the least local motion. Moreover earth is of so heavy a body, that it is rendered altogether incapable of circular local motion: otherwise were the Mass of earth so prone to such a swift circular motion, certainly its parts, as terrestrial mixt bodies would retain the same inclination to the same motion, which we find to be contrary According to the *Perip.* & this supposition all light bodies (ordinarily so called) must be said to be heavy, and all heavy bodies light; for bodies by them are counted heavy, which move downward, that is, towards the center; *ergo* fire must be said to be heavy, & earth light, because the one moves upwards to its supposed universal center, & the other from it: But this is absurd, Can a point move through so vast or almost immense a Region, and with that velocity? In all other Natural things we find that a Point of any Element hath no force or proportion to move through a span of another Element, although that point be supposed to be detained violently. Take a particle of Earth, which is no point, and let it fall out of your hand, it will hardly move down to the earth, or if it doth, it is so slow, that it is

is hardly perceptible ; but much less would a point move. If then the earth be but as a point to so immense a Region, it cannot be supposed to move. Possible you do reply, that it is impelled by an extrinſick movent : Suppose I granted it, its motion being violent, could not be durable ; besides the proportion of a point is infinitely too little for to receive such a most swift impulse, which through its littleness it would doubtless effuge. Were the Earth a Planet or Star, it is supposed it should cast a light, which is repugnant to its Nature, through which, as I have shewed before, she is rendered dark, and is the cause of all darkness. Were this absurdity admitted, all our knowledge, which hitherto wise men have so laboured to accomplish, would be in vain ; for as I said before, earth and earthy bodies must be light, fire and fiery bodies must be heavy, and enjoy their rest : water and waterish bodies must be likewise heavy, the air and airy bodies must be weighty, and enjoy their rest ; for if the earth moves, it is certainly moved through the air, the which according to that supposition must be immoveable, because all moveables (*omne mobile fit super immobili*) are moved upon an immoveable Subject : All dark colours must be supposed light ; all Astronomical appearances, shadows, sounds, tastes, Sents and all mixt bodies must then be understood to be contrary to what really they are. Scripture is likewise plain against it, *Job 26.7. Psal. 24. 2. For he hath founded it* (namely the earth) *upon the Seas, and establish it upon the flouds.* *Job 38.6. Whereupon are the foundations thereof* (to wit of the Earth) *fastened ? or who laid the corner Stone thereof ?* *Psal. 104.5. Who laid the foundations of the Earth that it should not be moved for ever.* What need there more words to confute so absurd an Opinion ?

But to return to my Proposition ; That the Earth must necessarily be the Center of the world. I proved it above, where I did defer the reason of its rest to this place.

The earth of all the elements doth alone enjoy her rest ; because she alone doth possess a Center, whereby she enjoyes her own natural internal motion ; but suppose another element to possess the place of her center, & the Earth to cover it immediately, then doubtless the Earth would continue in external motion (because its parts are violently detained from a center) & press upon that body (which doth oppose it by keeping her out of her place) - until she had removed it, which being removed, it could not be thought to be longer in

external local motion, since she had recovered her natural place, unless we should absurdly imagine, that one part should move against the other for to gain a penetration of bodies. If then *N. Copern.* *D. Origan.* and others, who strive to maintain the threefold motion of the earth (*viz.* of inclination and declination, its daily and yearly motion) had discovered, that the earth were violently detained by some other Element or body, then they might have thence demonstrated a motion; but then this motion could have been no other, than the motion of water is about the earth, whereby the earth would have moved about its detaining body, which if it had it would have been immoveable nevertheless as to its external place, only it would have turned about, and have made several appearances of faces, or spots: in brief it would have had the same motion, which *Copernicus* ascribed to the Sun. Hence it is more than apparent that the earth is the Center of the world and doth enjoy her rest. The reason of its rest is so demonstrative that no rational body can deny it. I proceed.

III. The earth may commodiously be divided into three regions, differing from one another in purity of body, weight, density, &c. The *first Region* I call the central region, because it extends nearest about the Center. Its Periphery is about 120. degrees, its Diameter is 38 $\frac{1}{2}$. This Region consists of most pure earth, and most freed from the peregrin Elements; wherefore its weight and density, is the weightiest and most dense. It contains no mixt bodies within it self, because it is so remote that the peregrin Elements cannot move thither; besides, that smallest proportion of peregrin Elements, which may happily be supposed to be detained in the central region is so much depressed and firmly detained by the weight of the earth, that it is impossible it should come to any head to constitute a mixt body. Its colour must be conceived to be a pure fundamental black.

* To wit, from the extreme circumference of the second region, to the circumference of the 1st.

The *second*, or the *middle region* contains in its circumference 240 degrees; its Latitude* is 19 $\frac{1}{2}$ degr. This region is less weighty and dense than the central, as being accompanied with a greater proportion of extraneous Elements. It harbours some mixt bodies, as imperfect stones, but no Metals. The reason of this assertion is drawn from the proportion of the Elements, which there are not enough in quantity to constitute the body of metals or perfect stones; besides, we cannot imagine that the earth should contain any hol-

lownesses

hownesses in the second region *, which are requisite (as I shall shew by and by) for the generation of perfect stones and metals.

IV. The *third region* of the earth comprehends in its circuit 360 degrees, in its Latitude (not its complear diameter) $19\frac{1}{2}$. This last or extreme region consists of most (th t is, more than the two former regions) extraneous Elements, because it is situated nearer to the proper regions of the said extraneous Elements, which do violently strive to enter her body (as you shall read anon) whereby and through which the earth, especially near to her surface is rendered of a very unequal temperature; where the extraneous Elements uniting together do raise a hollowness in the earth, and insinuate into one anothers substance or body, to which the coldness of the earth is very much conducing, thereby gathering or coagmenting the said Elements together, and unpelling them into one anothers body, and then closing them firmly; all which it performs through its coldness. Through coldness understand its compressing weighty *minima's*. Wherefore, do not still abide in your obstinate conceit that it is the Sun, which is the efficient cause of Minerals and Stones: For that is absurd. I prove it. That, which is the main efficient of Stones and Metals must be a contracting, condensing, and indurating substance; but the Sun is no contracting, condensing, or indurating substance; *Ergo* the Sun cannot be the efficient of Stones and Metals. The *Major* is undeniable. I confirm the *Minor* by proving the contrary, namely, that the Sun doth mollifie, because its flame is soft, and all heat is soft; for softning is nothing else but to dispose a body to bend easily into its self if pressed from without: But earth rarefied by fire doth easily bend into it self, if pressed from without. *Ergo*, The *Minor* is evident, because whatever is thoroughly hot & fiery is soft, as we see in red-hot Iron, in alive flesh, and all Vegetables. So that, by how much the more heat a body hath, by so much the softer it is, provided *quod cetera sint paria*. Further, What heat is there under the Earth? I confess there is more and less coldness under it, but no predominating heat. What heat can there be in *Greenland*, especially under the earth, and yet it is certain that many rocks and stones are generated there? They may as well say, that fire is the efficient cause of all those Islands of Ice. Again, so much as a substance consisteth of coldness and earth, by so much it participates of hardness; or by how much the less heat a body consisteth of, so much the lesse hardness it partakes of.

* Because of its depressing weight.

of. The matter of a stone in the kidneys or in the bladder was soft when it fluctuated within the vessels, but being detained in the kidneys its heat is diminished either through the intense heat of the Kidneys, which doth dissipate and attract the lesser heat from the matter retained in the cavity of the kidneys, through which excess of heat the terrestrial and thick waterish parts are coagulated and are closed together through the depressing coldness of the intrinsic earth and water. The same matter being retained in kidneys of a cold temperament, doth immediately through that degree of coldness coagulate and grow hard. The stone in the bladder is generally harder than the stone in the kidneys; because the one is of a far colder (that is less hot) temperament than the other. That in the kidneys is more friable, whereas the stone in the bladder is affected with a continuous firm thick waterish hardness. This I can witness by a stone being taken from a Patient by section, which that most learned and expert Physician Dr. George Bate shewed me six or seven years ago: This stone was reduced to that hardness, that I am confident an ordinary smart stroak of a hammer could scarce break it: Yet when it was within the bladder it was far distant from such a hardness; for a piece of the Catheter was unawares run into the body of the stone and broke in it, which was afterwards taken out with it; but after it had been exposed a little while to the air, it grew immediately to that hardness: What could be the cause of this but the hotter parts of the stone exhaling into the air, whereby the cold parts fell closer and thereby arrived to a greater hardness? The error of *Fernelius* is obvious in that he stated the intense heat of the kidneys to be the cause of a *Lithiasis*; for it happens as frequently in kidneys of a cold temperament: neither is it an (*instita renum arenosa callosa que dispositio a parentibus contracta*) hereditary, fixt, scabulous, and calculous disposition (as the same Author conceives,) which doth consist in a degree of temperament of the solid parts of the kidneys; for stones have been generated in kidneys of all kinds of temperaments: neither can it be said to be hereditary, for many a man hath been troubled with the stone, whose Issue never was so much as disposed to it; and on the other side, many a man hath been miserably tormented with the stone or *Duelech* as *Paracelsus* terms it, whose Parents never discerned the least symptom of a stone within their bodies; Nevertheless, as I said before, the temperature of the kidneys adds much

much to the accelerating of a *Lithiasis*. It is then certain that the greatest cause of lapidation or *λιθοποιήσις* is internal, depending upon the predominance of earth or coldness over the other Elements in a mixture. The *Focus* (or *Uterus* as *Van Helmont* terms it, that is the place where a stone or gravel is generated) must be a close hollow place; wherefore nothing can arrive to this close hollow place, unless it be liquid; for a thick or coarse body will be intercepted before it can reach thither. This liquid matter being now lodged within this cavity, the hot parts do exhale, because now through the hollowness of the place they have got liberty to distill, and free themselves from the heavy terrestrial and thick aqueous parts; whereas before when they were kept close together through channels and lodges shutting close upon them the hot parts were firmly contained within and bound up. This is necessarily and certainly demonstrative; and infers, that where ever close hollownesses are groved, and that liquid matter containing terrestrial and aqueous parts in it may reach to them, there certainly stones and metals can and may be generated. By virtue of this position I shall prove and shew by and by, that stones and metals may be generated in most hollow parts of the body of man. But to pursue my discourse: The hot parts being now freed from the terrestrial parts, and inhering in subtil airy ferocities do with more ease and force procure their passage through this close and hollow prison than they made their way thither, leaving the terrestrial and aqueous parts behind them for a Ransom, which by degrees are coagulated more and more according to the expulsion of the fiery and airy parts. Understand also the reasons of the qualification of the *Focus* or womb of stones and Metals.

1. It must be hollow, the reason of this is set down already.

2. It must be close; for were it not close but open the terrestrial and aqueous matter could not be detained there, but would have as free a passage as the thin parts. Besides, closeness conduceth to keep out extrinsick heat, which otherwise would again dissolve and mollifie the work; wherefore the hardest stones and metals are found some degrees below the Surface of the earth, and I dare confidently assert, that if metals were digged for deeper under the ground their labour would be richly answered by finding purer and better metals.

3. The coldness of these places must be a proportionable coldness;

ness; for if the places be too cold, then the liquid parts will be detained from arriving to cast up hollowneses by being too much inraffated and condensed, whereby the energy of their rare and subtil parts is suppressed.

4. The liquid matter must also have a due proportion of the Elements whereby to constitute certain kinds of stones and metals. If the matter be thick and terrestrial not containing many subtil and rare parts, then it will generate into a course stone. The reason of the courseness is, because the terrestrial and aqueous Elements are but rudely mixed, by reason they wanted internal heat, whereby their parts might be divided into lesser particles, and so become the more concocted and harder. In case the matter be more subtil and rare, and that the course parts are united in less particles, then the said stone will according to its degree of fineness and concoction prove flinty, *Marble, Jaspis, Cornelian, &c.* In case there be more thick water than earth, the body thence generated becomes crystalline; as *Cryſtal, Diamonds, Rubies, &c.* In these water doth retain almost its natural consistence, as I shall tell you immediately. In case there be an equal part of earth and water, and these well concocted and intirely mixt together, it produces Gold. If there be something more of water than earth, and they well concocted and permitted, they ingender Silver. If there be an equal proportion of water and earth, and they only rudely concocted and but half mixt, it generates Copper. If there be more earth than water, and but half mixt and concocted, it constitutes Iron. If there be more water than earth, and they but rudely mixed and rawly cocted, the effect will prove Lead, or according to the proportion of the ingredients and coction Pewter. Mercury is generated out of water being rendred fluid through much air and fire, containing withall a small part of earth. These do not only differ in proportion of materials, but also in degree of internal heat and of the temperament of their *Matrix*, otherwise termed a vein from its Cylindrical Figure. Gold had the strongest heat, whereby the parts were firmly united in *minima's*, which heat did after the performance of its office exhale by degrees; nevertheless suppose that there was a degree of heat left: the *matrix* of Gold must be very close for to retain that intense heat so long until the constituting parts are well permitted and concocted. As for the external temperament of the climate, it is little material to the business, since we see that Gold, Silver, &c. are generated in cold countries as

well

well as in hot, in moist as well as in dry. It is the internal temperament of the earth, which supplies fit matter for the generation of metals. The *Matrix* of Silver is less close, the *matrix* of Brass more open than it, and so gradually in the others.

Mines or mineral veins are usually found to be in hills or mountains, because these do generally contain hollowneses, especially if they appear dry and sandy without. Those mountains are for the most part best disposed for the generation of metals, that are situated at a convenient nearness to a pure crystalline river. Easterly mountains are most to be suspected, provided the River which is not far distant from them be easterly withall. The clearness of sky is no small token. A long Bar of Iron thrust into the ground after having digged to some depth, if it changeth whitish or yellowish, gives no small suspicion of Gold or Silver. A long trunk peirced likewise into the ground where suspected as deep as may be, and afterward applying the ear to it, if it renders a tinging or fibulous boyling noise, is a sign of some hidden treasure under that soile.

That the generation of Metals is such as I have proposed may be demonstratively proved by sense from their colour, consistency, difficulty of liquation, from the theorems of concoction, the which since you may easily collect from what hath been hitherto discoursed upon, I shall omit any further proof.

V. The present occasion doth urge me to touch somewhat upon the transmutation of Metals. The difference, which there is between them you may collect from their matter, degree of coction and disposition of *matrix*: However there is more agreement between themselves, than there is between them and stones; wherefore the question is, Whether Silver is transmutable into Gold. Here I propose the doubt according to its most probable appearance, there being less difference between Gold and Silver than between Gold and any of the others. I answer, That naturally it cannot be, because it is impossible that after Silver hath once acquired its form, it should be convertible into a perfecter form: Because heat is deficient, for it is exhaled; neither was there ever at its highest internal heat enough to have concocted it into the nature of Gold; or had there been heat enough there would have been too much water and air: The case is less probable after its constitution, specification, & individuation that it should change into another *species*, or another

Eccc *individuum.*

individuum. If the transmutation to a greater perfection of all other *species* and *individua* be impossible, so must this also : But the Antecedence is true, *ergo* the consequence likewise. I grant that it is possible to reduce it to a more imperfect and base *species*, that being plain in all corruptions. Wherefore I say that it seems more possible to reduce Gold into Silver, Silver into Brass or Pewter, Brass into Iron, and Iron into Mercury, by means of an artificial corruption, because the finer Metal may be thought to contain the coarser as an inferior degree, whence it is ascended ; but the finer cannot contain that in it self, which is finer than it self is. Neither can our proposed transmutation be effected by any art of man, unless he knew a means, wherby to detract such a proportion of the redundant waterish parts of the Silver, as that there might remain just as much as is required to constitute Gold ; besides the work will need a strong and vehement internal concoction, and that to a certain degree, and for a certain duration. It will require also a justly disposed *matrix*, all which I conceive impossible to art. They may as well strive to make a Ruby or a Diamond out of a Flint. Happily you will object, That some have converted Silver and Brass into Gold through the admission of some volatil subtil penetrative particles, which were of that force, as might be supposed to have divided the whole mass of Silver and penetrated into and through all its *minima's*, whereby the gross parts fell closer to one another and become perfectly concocted, so as through their consistency to represent the true weight and colour of Gold, which might really pass our censure upon a Touchstone. I answer, That it is possible to change a coarser metal so, that it shall be like to Gold both in weight and superficial colour ; but then this colour will not be equable throughout all its parts, neither are the parts so digested, concocted, and closely united as they should be. In fine, this artificial Gold is no more real Gold, than an artificial Pearl is like to a true Oriental one, or a glass Diamond to a true one. At the best it is but counterfeit Gold, which immediately shall be dissolved by *Aq. Fort.* whereas the other will not suffer it self to be toucht by it, unless it be fortified by a rectification upon salt Armoniack.

Chymical furnace hunters do strangely boast of their secrets of preparing *aurum Potabile*, or tincture of Gold. Others do through ignorance of the art and want of skill assert the said preparation to be impossible. Questionless were the thing of a harder nature, these laborious

laborious Vulcans would work it out ; nevertheless their arrogance and immodesty in proclaiming of the transcendent and admirable effects of it doth forfeit their modesty and wrong that noble Art. *Aurum potable* (say they) is an universal medicine curing all diseases, restoring youth, and retarding old age, prolonging life to an equal duration ; in fine *Aurum potable* is good for all things ; or rather *Aurum portabile* is. Here you have a great many rash and vain words, the contrary whereof I have so oft seen come to pass. I have known it to cause a dysentery through its corrosive spirits, which it retains either from its last *menstruum*, or from its first Dissolvent, viz. *Aqua Regia*. It provokes Sweat and Urin, but withall is very offensive to the Liver and heart, because of the said adventitious spirits. That, which they call the tincture or *quinta essentia* of Gold is nothing but the outward rust of Gold, which the *aqua regia* begot upon it through its corruptive quality.

In summa, the natural fixt spirits of Gold are inseparable, or at least those that are separable are corrupted by the poylonous spirits of the dissolvent. Suppose they were separable from its body without being stained, the most we can conceive of them is, that they are a subtil *diaphoretick* ; and then hardly comparable to others, whose nature is more consentaneous to ours, as *spir. C. C. tinct. Croci. Lilium Antim. Paracelsi*, &c.

Besides these forementioned hard bodies the earth doth also ingender others less hard, and some soft ones, consisting of a more airy and fiery nature. These are in like manner conceived in *Matrices* or wombs, differing from the others in length, exility and shape. Of these there is a double sort observable, the one being more fiery and waterish, the other more airy and fiery. The first is saline, the other unctious. Stones and Metals being more earthy and consentaneous to the nature of earth are retained and cherished within the earth ; but the others being much distant from its nature are expelled nearer to its Surface. I shall first begin with the salin bodies.

VI. There is a certain fermentation within the earth, which is nothing else but the contraction of the earth by the compression of its parts upon one another, whereby the extraneous Elements are expelled ; but since these cannot be abstracted from the body of the earth without the firm and close adherence of some earthy *minima's*, they do draw them along ; the proportion of which earthy *minima's*,

and their degree of closeness of union do constitute the differences of all earthy mixed bodies. The *Salin juyces* are attenuated watery bodies permixt with condensed fire, and a small proportion of earthy *minima's*, which do concreate by the evaporation of the greater part of air, leaving behind it water thickned naturally through its absence. Fire is closer united to these salin juyces, than it is to the unctuous ones, to which air is more close united than to these. Many of these salin juyces are transparent through the predominance of water, others are of other colours according to the proportion of earth. We see that among these many concreate in an angular form, as appears in Allume, Vitriol, &c. which happens through the degrees of the air's evaporation; for the air evaporating unequally causes such an angular induration. The air doth evaporate unequally, in that it doth sooner desert the extream parts, as being less thick and dense, & more remote from the central ones, which do retain the air the longest. The first evaporation leaves an acuteness for an angle, the second subtilities, as being more slow, evaporate by degrees, so causing a greater obtusion from the foresaid acuteness. The evaporation it self is caused by the weighty Elements expelling the light parts through their weight.

The earthy *salin juyces* are principally these, *Common salt*, *Salt gemme*, *Saltpeter*, *Allume*, *Salt armoniack*, and *Vitriol*.

Common salt is nothing but the reliet or residence of sea water, or of saltish fountain water being evaporated. This kind of salt contains more loose air, but less fire than others.

Salt gemme is a fossil salt digged out of the earth, and is somewhat more fiery and consistent of closer ayr than the former.

Saltpeter is threefold. 1. Is drawn by coction from nitrous earth.

2. Sweats through stone walls and concreaseth upon their Surface, like unto a white frost or mould.

3. Is gathered from the rocks: This salt consisteth of more dense parts of fire pent in by close air, which again is enclosed by subtil *minima's* of earth.

Allume comprehends five sorts. 1. *Roch allom*, which is drawn from Rocky stones. 2. Which is digged out of Mines. 3. Which remains after the evaporation of mineral waters. This salt is of a courser nature, consisting of more water and earth than the others.

Salt armoniack is a salin juyce sweating out a certain earth of *Libya*, and concreated under the sands. That which we use instead of it is an artificial salt, by far of a lesser efficacy, made out of five parts of mans urine, one part of common salt, and half a part of wood soot, being boyled together and evaporated to a consistence. This sort of salt is stronger than any of the others, consisting of a dense fire closely knit with air and incorporated with a watered earth.

Vitriol is known in several sorts, 1. There is *Hungary* or *Cyprian Vitriol* of a sky colour like unto a Saphir, compact like Ice, and dry. 2. Is of a greenish colour concreated in grains or crums like unto common salt, but withal or somewhat unctious. 3. *White Vitriol*, like unto loaf-sugar. *Vitriol* may justly be censured half a metal, it consisting of the same course parts, of which Iron and Copper do consist of. It contains much earth mixt with a dense fire.

VII. The unctious and bituminous bodies generated and cast forth by the earth are *Sulphur*, *Arsenick*, *Amber*, *Naptha*, *Peteroil*, *Asphaltos*, *Oyl of earth*, *Sea-coal*, and *Gagates* or *Jeat stone*.

Sulphur is an unctious juyce of the earth concreated within a particular matrix, and consisting of dense fire inhering in a loose incrassated air.

Arsenick comprehends three sorts. 1. Is yellow, and is otherwise named *Auripigmentum*. 2. Being red is called *Sandaracha*. 3. Is singularly named *Arsenick*, or crystalline *Arsenick*, being of a whitish colour. Their body is constituted out of a most dense fire united to a thick air; from this extreme density of fire it happens to be of that corrosive and venomous nature, that it proves an immediate poyson to man, because through its intense dense heat, it extracts, expels, and suffocates his natural heat, in which respect it is but little less corruptive and hot than focal fire. Of these three sorts *Arsenick* is counted the least caustick and malignant, the next *Auripigmentum*.

Amber is known by three sorts. 1. There is that, which is particularly called *Amber*. 2. Is called *Succinum*. 3. Is whitish *Amber*, otherwise called *Sperma Ceti*. Whether there is any black *Amber* is doubted: Some do affirm it as having seen it. A mistake certainly, either they took *Jeat*, or some other substance made out of *Musk*, *Lign. Aloes*, *Syrax* and *Ladannum* for it. Grayish *Amber* (otherwise called

called *Ambergreece*) is thought to be the purest, smoothest, and of the best Sent. *Succinum* is of two sorts, viz. white and yellow. *Sperma ceti* is by many deemed to be found supernatant atop the Sea, who assert it to be rather the Seed of a Whale; if so, then it must have been generated in their Stomacks or Throats, some having found some quantity sticking in their Throats: but this doth more probably argue, that it was supernatant atop the Sea, and devoured by the Whale. But for what I know, this may be a Story, nevertheless it is certain it hath been gathered in the *Indian* and *Aethiopian* Seas near to the Shore, where Whales have scarcely ever appeared. Neither can I imagine this to be that, which ancient Physicians called the Flower of Salt, there being too great a difference between their Descriptions. Flower of Salt is described to be reddish and liquid, and to be of a detergent Nature and saltish tast, whereas the other is a white furfuraceous fatness, being of an emollient Nature, and of a fat tast, and in all particulars directly contrary.

Ambergreece happens to be supernatant upon the Sea, and some Fountaines too, from being communicated by the earth in bituminous and lixivious exhalations, and exalted and purified by the motion and subliming faculty of the Sea, coagulated atop through the exhaling of the hotter spirits and concreated by the ambient coldness.

The *Succinum* or common Amber wanting that exaltation and sublimation, is found in *Germany* and *Italy* in Mines to be of an inferior nature. It is also gathered from the Sea. The Spirits of Amber are rare and subtil, consisting of a thick airy body.

Naphtha and *Peteroyl* differ from Amber in consistency and greater quantity of fire and air, these being liquid and more inflammable, but in all other particulars agreeing, *Peteroyl* and *Naphtha* having oft been found to lodge in liquid substances within the body of common Amber. *Naphtha* is gathered in great quantity about *Babylon*, the earth there being so tempered with the peregrine Elements, that it protrudes abundance of this kind of *Bitumen*. *Peteroyl* is most frequently collected flowing out of Rocks.

Asphaltus is a hard black and splendid *Bitumen*, like unto shining Pitch, heavy, and of a strong Sent. It is gathered swimming atop of Lakes; in other places it is taken out of the Earth near to its Surface. The *Mare mortuum* in *Judea* affords the best and greatest

rest quantity. This is different from the others through its containing a greater proportion of Earth, and greater density of Fire.

As *Peteroyl* flowes out of the Rocks, so doth Oyl of Earth out of the Earth and Hills in some parts of *East-India*. It is of a transparent Red, and a strong Sent like unto *Peteroyl*, but more pleasing.

The vertues of all these *Bitumens*, excepting *Arsenick*, are prayed for their enollent, discutient, comforting the Brain, the Nerves and Membranes, thence healing wounds by comforting the *calidum innatum* of the said parts when wounded, and for their anodyne nature, thence giving ease to the Joynts in Arthritical pains: all which they perform through a Subtil and Balsamick Spirit.

Sea-coal is called by the *Latinists* *Carbo Petra*, and *Terra Ampelitis*; notwithstanding the latter name denotes a thing somewhat distinct from the former, in that it is more bituminous and less hard. The other is nothing but Earth and *Sulphur* concocted and conglutinated into a stonish substance, and is no where ingendred, but where the Earth is hollow, and fecundated with store of a sulphureous *Bitumen*.

Gagates, or *Jear*, is a *Bitumen* of a more concocted body, and more sulphureous. The Proverb speaks it to be very black. It is kindled and burnes assoon as Brimstone if toucht by fire, and gives a Bituminous Scent. Its vertue is the same with other *Bitumens*.

VIII. Besides these, there are some other mean bodies generated within the Earth, which are neither Metals, or Saline, or unctious Juyces; they are not so hard, nor so much concocted as Metals, neither are they so loose and rare as Saline and Unctious Bodies. They are particularly these: *Mercury*, *Antimony*, *Marcastia*, *Cobaltum*, *Chalcitis*, *Misy* and *Sory*. The first we have treated of above.

The next is *Marcastia*, otherwise *Bismuthum*, which is a heavy, hard, brittle, whitish body, shining within with little points of Gold and Silver. Its Matter is too coarse to generate Gold or Silver, but is as it were the Dross of them both, and is separated from them as a Natural Excrement, which is concocted into a Body of a courser Substance. Its Spirits are more dense, and Earth is more in proportion; Water less. This hath endued the Nature of Venom, because of its dense heat. You are not to conceive that this is only an Excrement.

crement of Gold and Silver, but that it is also a perfect body primarily generated out of the same proportion of the Elements within a proper *Matrix*, and therefore is to be found in Mines, where there is no sign of Gold or Silver. It is repercutient from its earth, dissolving and detergent from its dense fire, if applied externally. Its water is a very potent dissolvent of Gold and Silver.

Cobaltum, otherwise called Natural *Cadmia*, is the courser Body or Excrement of Copper. It is weighty, and of a black colour. Its fire is extremely dense, in such a manner, that it is thence rendered to be the strongest Poyson. Its caustick and corroding quality penetrates so violently through the Gloves and Shoes of the Diggers, that it ulcerates their hands and feet.

Chalcitis, *Misy* and *Sory* differ from one another in courseness of Substance, and are oft found to grow one atop the other.

Chalcitis is like Copper, and brittle; in consistency of courseness it is between *Sory*, which is thinner, and *Misy*, which is somewhat thicker than it.

Misy is of a Brass colour, glistering through its body with Sparks like Gold, growing about *Chalcitis* like an outermost Crust, or like Rust about Iron.

Sory is a Mineral, hard and thick like to a Stone, glistering with yellowish Sparks. These three are of a caustick quality, thereby burning Scars and Crusts into the Flesh; besides they are somewhat adstringent. *Misy* is the strongest, and *Sory* is the next to it in strength.

Antimony is a Mineral of a blewish colour, shining throughout its Body like Streaks of Silver, its mixture is out of course earth and dense fire, yet less dense than any of the foregoing. Its virtue is internally vomitive and purgative, externally it is discutient, detergent and adstringent. All these are natural recrements of Metals, yet not recrements alone, as I said before.

Bombast and his Sectators analyze all Metals and Minerals into *Sal*, *Sulphur*, and *Mercury*; as if they were all generated out of these, as their first Principles; for say they, our Art instructs us to reduce every Metal or Mineral into each of those foresaid Principles.

Either this is to be understood, that it is possible to reduce all Minerals really into *Sal*, *Sulphur* & *Mercury*, or into some certain more connected beings analag to them. Generally they seem to pretend

pretend to educe real *Mercury* out of all Minerals; but as for the others they are only analogal. Why should they more expect to extract real *Mercury* then real *Salt* or *Sulphur*? Wherefore it will be more consistling with Reason to conclude them all equally analogal, that is like in consistency to ordinary *Mercury*, *Salt* and *Sulphur*, but not in effect. It is a Madness for any one to imagine, that Gold is constituted by the same *Mercury*, but more concocted, that is usually digged out of Mines; and that *Mercury* is convertible into Gold, if thereunto intended by a strong concocting preparation. They might as well say, that Gut-Excrements were convertible into Flesh, and that flesh consisted out of the said real Excrements.

The Case is thus: *Mercury* is by the n accounted to be an Excrement of Metals; wherefore as an Excrement is a Body really different from those bodies, from which it is rejected, and in no wise convertible, unless it be some of the purest parts of it, that have escaped natures Diligence; so neither is *Mercury* any part of Metals, nor convertible into them, unless it be the smallest purest parts, which had fled the earths Metalliferous quality.

Possibly you will Object that Gold feeds upon *Mercury*, and *Mercury* upon it, wherefore they are convertible into one another Nature.

I deny the Antecedence: for Gold is dissolved and destroyed by it; as appears in *Amalgamation*, or dissolving Gold by the fume of *Mercury*; ergo it is not fed by it.

Mercury effects no less in the Body of man; for it dissolves his humid parts, yea his solid parts too, as *Mercurial* Salivations testify. All which is a sufficient Argument to induce us to forbear from explaining the Causes of Natural Beings by *Salt*, *Sulphur* & *Mercury*.

Probably you reply, That this is not the meaning of *Bombast*, who intended these Names only to be analogal to those things vulgarly so called. Wherefore by *Mercury* is understood a thin pure liquor, by *Sulphur*, a subtil Spirit, by *Salt*, the gross substance of a Body.

I Answer, Either you must take these for first Principles, or for mixt bodies; they cannot be the first, because his *Mercury* is constituted out of water reduced from its greatest hardness into a subtil fluor through admixture of Air and Fire: His *Sulphur* consists of fire condensed by Earth, and of Air; ergo they must be mixt Bodies;

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if so, they are no first Principles of Metals, because even these are reducible into more simple bodies, viz. his *Mercury* into thick water, a thin air, and a rare fire; *Sulphur* into air, fire, &c. This I will grant them, that all Metals are dissoluble into such kinds of analogical Substances, which are not bodies less mixt, but only changed into bodies of several consistencies, viz. thick and thin, coarse and fine.

CHAP. II.

Of Stones and Earths.

1. *A Description of the most Precious Stones.*
2. *A Description of the less Precious Stones that are engendred within Living Creatures.*
3. *A Description of the less Precious Stones that are engendred without the Bodies of Living Creatures.*
4. *An Enumeration of common Stones.*
5. *A Disquisition upon the virtues of the forementioned stones. An Observation on the Effects of Powders composed out of Precious stones. Whether the Tincture of an Emerald is so admirable in a bloody Flux.*
6. *A particular Examination of the virtues of a Bezoar stone, Piedra de Puerco, Pearles, &c.*
7. *The Kinds of Earth; and their Virtues.*

Our Method hath led us to propose the Demonstration of universal Natures before that of particulars, and that of Metals before the other of imperfect Minerals and Stones, as being more excellent through their perfection of mixture; wherefore we have next allotted this Chapter for the treatise of the particular natures of Stones.

Stones are either known under the name of most Precious, less Precious, or Common.

The most Precious Stones are ordinarily called Jewels, being 18 in number. 1. An *Agathe*. 2. An *Ametist*. 3. An *Asterites*. 4. A *Bezoar*. 5. A *Carbuncle*. 6. A *Chalcedonic*. 7. A *Chrysolite*. 8. A *Diamond*.

Diamond. 9. An *Emerald.* 10. A *Jaspis.* 11. An *Iacintb.* 12. An *Onyx.* 13. A *Ruby.* 14. A *Sarda.* 15. A *Saphir.* 16. A *Sardonix.* 17. A *Topaze.* 18. A *Turcois.*

An *Agathe* is a stone of divers mixt colours, and in no wise transparent.

An *Asterites* is a stone somewhat resembling Cryстал, and within the Moon when she is at full.

An *Amethist* is a stone of a Violet colour.

A *Beril* is of a Sea-green colour, and sometimes is found to have other colours mixt with it. A *Prase* is not unlike to it, only that it is not of so deep a green, neither so hard; for it wears away by much usage.

A *Carbuncle* is esteemed for the most precious of all Stones, and is of a Gold or Flaming colour. It is said that there is a kind of a Carbuncle (called a *Pyrope*) to be found in the *East-Indies*, which shines as bright in the Night as the Sun doth in the Day.

A *Chalcedonie* is a stone of a Purple colour.

A *Chrysolite* is of a Golden colour, hard and transparent.

A *Chrysoprase* is hard, and of a greenish colour.

A *Diamond* is thought to be the hardest of all Stones.

An *Emerald* is hard, and of a perfect green colour.

A *Jaspis* is of a greenish colour, spotted here and there with bloody Spots.

An *Iacintb* is of a Gold or flaming colour. Some of them decline from a Yellow to a deep Saffron red, or sometimes to a blewish colour. They are neither perspicuous or opake, but between both.

An *Onyx* is of a brownish white, but of a dull transparency.

An *Opale* stone is by *Pliny*, *Lib. 37. c. 6.* accounted for the best and rarest of Stones, as participating of the rarest Colours of the rarest Stones: its fire is more subtil then of a Carbuncle, shining with a Purple of an *Amethist*, greenish like to the Sea-green of an *Emerald*, &c.

A *Ruby* is a reddish stone. A *Granate* is a worse sort of *Rubies*.

A *Sarda* is of a transparent fiery red colour: A *Cornelian* is comprehended under it.

A *Sardonix* is composed (as it were) out of a *Sarda* and *Onyx*; it is scarce transparent.

A *Saphire* is opake, but of a clear sky or blew colour, and very hard.

A *Turcois* is opake, and of a colour between green and blew.

A *Topaze* is transparent, and of a colour between a grass green and a Saffron yellow: it is falsely confounded with a *Chrysolite*, there being a very discernable difference between them.

II. The less Precious Stones are found either within the bodies of living Creatures, or without.

Those that are found within the Bodies of Living Creatures are,

1. The *Bezoar* Stone, which is found in the Belly of an *Indian* Goat-Stag, a Beast in some parts like to a Goat, in others to a Stag. The Stone is for the most part of a dark green, yet some are found of a yellowish, others of a Brown and Olive colour. They are brittle and friable, containing oft-times a Straw, or a small Kernel in the midst of them, about which there congregate a slimy matter backing to it in Blades. There are two sorts of them, *viz.* Oriental and Occidental.

2. A *Tair* of a Stag is a little Stone engendred in the corner of a Stags eye. It is very bright, smooth, round, very small and light. Its colour is yellowish, mixt with a few black streaks, and gives a strong Sent.

3. The Stones of a Goat are taken out of its Stomack or Gall.

4. There are also Stones found in the Stomack and Gall of an Oxe.

5. The *German Bezoar* Stones are taken out of the Bellies of some Does that haunt the *Alpes*.

6. The Stone of an *Indian* Hogge, or as the *Portugueses* call it *Piedra de Puerco*, is found in the Gall of an *East-India* Hogge, or in the Stomack of a Porcupine; it is soft and fat to feel to, just as if you felt a piece of *Castile* Sope.

Pearles, that are generated within the Bellies of Sea-shell-fish, as of Cockles, Muscles, or Sea-Oysters. These do most gather to the Sea-shore about the Spring, where they, (or rather the Sun through its drying faculty) do open their shells, whereby that glutinous and clear moisture, which they had retained undigested a long time in their Bellies, and now being freed from its airy parts, doth congeal through compression of the remaining thick waterish substance: which, if they do happen to be engendred, when the sky is dampish and cloudy, are affected also with a cloudiness, as not being sufficiently purified through the driness and heat of the Sun and the ambient

ambient air. As long as they be under water, they are soft; but after a short time lying in the dry air, they do soon grow hard. When they are taken out of the shell some of the Fishes flesh cleaves to them, which they usually bite off by covering them for a while with Salt.

2. The *Alectory Stone* is taken out of a Cocks Maw. This stone is more frequently found in Cocks, when they are in their fourth or fifth year.

3. A *Bufonine* is a Stone found in the head of an old Toad; its shape is for the most part long or round.

4. A *Chelidony* is taken out of the Maw or Liver of a young Swallow; its colour is a black mixt with a little red. Sometimes they breed two together, whereof the one is more blackish, the other enclines more to a red.

5. The *Carp-stone* is white without, and yellow within, being found in the throat of a Carp. There is also another triangular stone engendred in the head of it, besides two long stones more sticking above its eyes.

6. The Stones of a *Crab*, otherwise called *Crabs-eyes*, are white and round.

7. A *Saurine* is found in the Belly of a Lizzard.

8. A *Limace-stone* is engendred in the head of a House-Snail.

9. The *Perch-stones* are taken out of the head of a Petch, near to the Back-bone.

III. The less pretious Stones found without the bodies of Living Creatures are,

1. The *Aerine*, or *Eagle-stone*, which is found in an Eagles Nest, and is of a light red colour.

2. Coral, which is a shrub of the Sea, being green and soft under water, but as soon as it is plucked from the bottom of the Sea, and exposed to the air, it becomes red and hard like unto a stone.

Hence *Ovid. Lib. 4. Metam.*

Nunc quoq; corallis eadem Natura remansit.

Duritiem tactu capiunt ut ab aere quodq;

Vimen in aquore erat, fiat super aquore saxum.

There are several sorts of it, viz. Red, Green, White, Yellow, Brown, Black, and of a mixt colour. Some pieces of Coral appear

pear to be half Wood and half Stone.

Crystal waxeth upon the snowie Hills; It is oft found upon the *Alpes* that divide *Italy* from *Helvetia*. Its shape is hexagonal, the cause is the same with that of the angular shape of *Alume*. Authors are at great variance whether it is generated out of Ice. No certainly, for Ice is nothing near so clear, neither can it be purified after its concretion. Its Matter then is the subtiler and purer part of Snow concreated and congealed: for what is more crystalline and pure then the liquor of Snow, as being purified from all gross parts through its first evaporation from the waters to the Heavens, and thence precipitated pure, and freed from its greater part of terrestrial admixture? I need not add more for to explain its generation, since it is generated in the same manner that all other stones are generated.

The *Hematite* or Blood-stone is of an Iron colour permixt with bloody streaks: some are more blackish, others yellowish.

The *Galactite*, or Milk-stone is of an Ash colour.

A Marble is a smooth shining stone, admitting of sundry colours. It is known by three sorts.

1. *Alabaster*, which is a white transparent Marble.

2. The *Porphir stone*, which is drawn through with red and white streaks.

3. An *Ophir stone* whose colour is a green, spotted with spots like unto those of a Serpent.

A *Sarcophage*, or flesh-eating stone is of an Ash colour. It derives its name from eating mans flesh away without pain.

A *Lazul-stone* is of a blew colour, speckt within its body with Golden specks like unto so many stars.

An *Armene-stone* is of the same colour, excepting that in stead of Golden specks, it is marked with green, blew, and blackish spots.

The *Themeade* is a stone which driveth Iron from it, wherein it proves contrary to the attraction of the Loadstone, upon which we shall insist particularly in a Chapter by it self, as requiring a more distinct and nice search.

The *Nephritick stone* is sent hither by the Inhabitants of *Nova Hispania*; it looks greasie about, as if it were besmeared with Oyl.

Its colour is for the most part a light green, others are of a mixt colour. It is thought to be a kind of a *Jaspis*.

The *Judann stone*, so called because it is frequently found in *Ju-*
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das, and in some parts of *Silesia*, being friable, and round like to an Olive, of a pale ash colour, having even streaks running down its length, as if they were artificially marked upon it. The greater of them are called Masculine, the lesser Feminine.

The *Leopard-stone* is of a long, round and pyramidal figure, whereof some are whitish, or of an ash-colour; others blackish, and transparent, like to Muscadine wine.

IV. Common stones are either porous and spongy, or solid and compact. The first kind comprehends a *Tophe*, a *Pumice stone*, and a *Sponge stone*. The latter is divided into a *Rock*, a *Rock-stone*, a *Flint*, an *Emrod*, a *Whetstone*, a *Gravel-stone*, an *Amianth*, a *Chalck-stone*, a *Talck-stone*, a *Glass-stone*, a *Calaminar-stone*, and an *Ostiacolla*.

A *Tophe* is a stone something harder then clothy Sand, and friable like to it.

A *Pumice stone* is cavernous like to a Sponge, fit to make a thing smooth with.

A *Sponge stone* is concreated in a Sponge, being of a whitish colour, but friable; it is otherwise called a *Cysteolithes*.

A *Rock* is vulgarly enough known, and therefore needs no description. Rock stones are great stones cut out of a Rock, wherewith they build houses.

A *Flint* is unknown to none.

An *Emrod* is a stone wherewith Glasiers cut Glasses into pieces.

A *Whetstone* declares it self through its name, whose finer sort is called a Touchstone, and serves for to try Metals upon.

Gravel-stones are found every where upon the sides of Rivers, and upon Hills.

An *Amianth* is somewhat like to Feather alume, nevertheless differing from it in aptness to take fire, whereas fire will not take hold of the *Amianth*; besides alume is of an adstringent tast, the other not.

A *Chalck-stone* is, whereout they burn Lime for to build houses.

A *Talck-stone* is only commended for a Cosmetick.

The *Glassestone*, otherwise called *Muscovy Glass*, is transparent like to an ordinary glass; and may be cut into very thin Leaves. It is of various colours, viz. white, yellow, brown, black.

The *Calaminar stone* is of a yellow colour, or rather a yellow mixt with ash, red, or brown: It is of no great hardness.

V. *Physiologists* do usually ascribe great vertues to most stones, especially to the most precious of them, possibly because they are bought.

bought at a dear Rate, and therefore they ought to respond in their internal virtues to their extrinſick value. But let us make a juſt diſtinction upon their Natures.

The *Agathe* is ſaid to be good againſt all Venom, particularly againſt the Bite of a Scorpion: It makes a man wiſe, prudent, and eloquent. I ſhould be loath to rely upon the virtues of an *Agathe* were I bit of a Scorpion, or to undertake to cure a Fool with it of his Phrenſie: its ſtrength, whereby it ſhould produce theſe effects, is very occult. Venoms admitted through the pores, are to be expelled with the ſtrongest Diaphoreticks; but I could never hear an *Agathe* commended for any ſuch effect. To the contrary, it hinders the Cure of all poiſons, becauſe it is obſtructive, unleſs it be exhibited in a large Doſe.

An *Aſterite* comforts the Brain, and cures all its diſtempers. How can it, ſince its ſpirits are fixed, and do never reach the Brain?

An *Ametiſt* repreſſes Vapours flying up from the Stomach, and hinders Drunkenneſs: This may be true, ſuppoſing they take a great Doſe of it, and that they do not drink above a Glaſs or two.

A *Beril* is good to cure a ſuperficial wound of the eye; but *Tunica* is much better.

A pale *Carbuncle*, *Chryſolite* and *Topaz* are regiſtered to reſiſt venom, to comfort the heart, and to drive away Melancholy, and Luſt: I ſuppoſe it will ſcarce work upon a Satyre.

A *Chalcedony* is good againſt Melancholy, and makes a man merry; but not comparable to a Glaſs of Sck.

A *Cryſopraxe* is thought to be good againſt the trembling of the heart, and to conduce to the cure of a miſty and dim ſight: To the contrary, it cauſes a palpetation of the heart, and in a ſmall quantity it is obſtructive; and for the ſight I alwaies apprehended a green colour, as of a *Beril* or *Emerald*, to be more agreeable with it.

A *Diamond* is praiſed for its virtue of removing the palpetation of the heart, and of producing Mirth: but not through any intrinſick virtue, but extrinſick value, eſpecially to a poor mans eye. They ſay, that it obrundereth the attractive power of a Loadſtone; very probably that it doth, in caſe it is included cloſe within the body of a great Diamond.

An *Emerald* and an *Iacinth* are commended for their Alexipharmical virtues againſt poiſon, and for curing the falling ſickneſs.

A *Jaspiſ*, *Saphir*, *Topaze*, *Onyx*, *Sarda* &c a *Sardonix* for chearing the heart,

heart, stopping a fluxe of blood, preserving Chastity, and promoting travel.

A *Ruby* and a *Turcois* for clearing the sight.

How these kinds of Precious stones should produce these admirable effects is unknown to me. First let us enquire into the truth of the $\delta\tau$ of the n , then of the $\delta\delta\tau$.

As touching the certainty of the $\delta\tau$ falsely ascribed to them, I must evidence from my own experience that I have oft prescribed the chiefest of them, being besides artificially prepared *viz.* *Magist. Perl.* Powders composed out of *Fragm. of Granates, Iacimhs, Rub. &c.* in extreame weakneses, and have very diligently observed their Effects.

The Effects, which I perceived to flow from these immediately after the exhibition of them, were a present refocillation of the vital spirits, and as it were a more vigorous motion of the Arteries; but then such pulses caused by the foresaid motion were very unequal, sometimes remitting, other times intending in their strength. Besides, this alteration of motion would last in some not above an hour or two at most, in others not longer then a score of Pulses, or frequently not above a Pulse two or three after the taking of it.

In the next place, let us search into their $\delta\delta\tau$

1. We gather that the heart was affected by them, but how? not primarily and immediately, (as if some volatil spirits had been united to the Arterial spirits, and so communicated to the heart;) because the spirits of these kind of stones are so much fixed to their matter, that they are in a manner inseparable, although endeavoured by Chymical diligence; that they are so, is undoubtedly true to those that have made trial of it. If the real Tincture of Coral or of Gold is so difficult, if not impossible to attain unto, much more of these, which exceeds the other by far in fixation of bodies. That the spirits of these Precious stones are so entirely fixed, their not wearing though much used, is a manifest Argument, which, if their spirits were volatil, would as much befall to them as to others. They are much of the Nature of Gold, which although you expose to the strongest heat of fire, will not yield a *Minim* of its weight; if so, then we cannot imagine, that any whit of their volatil Nature should be separated by our weak heat; if *Aq. Regia* is too inferiour to separate their spirits from their earth, much less our mild Ferment, But supposing an impossibility to be possible, *viz.*

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* viz. To operate presently from the stomach upon the heart, as soon as the medication is swallowed down.

that by length of time this might be effected, yet it cannot answer to the cause of so immediate an effect; neither must we fly to that worn out Sanctuary of ignorance *Occult Qualities*; for it is denied to these also to act at a distance *. But to keep you no longer in suspense, the truth of the matter is this; the Heart, the Brain and the Liver do alwaies sympathize with the Stomack; the one through commonneits of Membranes and Nerves of the sixth pair, the other through the Branches of the Cœliacal Artery, the last through the Mesenterical and other Branches of the *Vena Porta*, especially in extreame weaknesses. This is evident, Drink but a Glas of Wine, and immediately your vital spirits will pulsate more vigorously, your Animal motion will be rendered stronger, and your Veins will swell upon it. Wherefore the Stomack being much relaxed in most weaknesses, and filled with Damps and Vapours, and sometimes partaking of a Malignancy, doth through the same Relaxation by continuation relaxe the Arteries, Nerves and Veines inserted into her body, whence their spirits are necessarily rendered feeble and moist. Now then, the Stomack being somewhat cleared of these moist evaporations, doth recover a little strength, which in like manner the foresaid Channels and Spirits do immediately grow sensible of: which if so, the case is plain; to wit, that the benefit, which the noble parts receive, doth derive from the depression of these damps, through the weight of those precious Powders; the same sinking to the bottom to conglomerate and contract the stomach, by which contraction they expel the aforesaid Vapours. Exhibit any weighty Powders, as of Coral, Crystal, Bole Armen, &c. they will refocillate the Spirits, and prove as suddenly cordial (although *ex accidenti*) as others of the most precious *Carbuncles*, or *Magistery of Pearl*; which is an undoubted sign, that it is nothing else but their dense weight whereby they operate those Effects. Neither must you infer hence that I assert, that all weighty bodies are cordial; no, but only such as are densely weighty, and have no noxious quality accompanying of them; provided also their weight be not so excessive, as to overpress the stomach.

By all this it appears, how far Jewels may be said to be Cordial; as for any other effects that are ascribed to them, they are fictitious and deceitful.

You may Object, that the Tincture or rather *Magistery of Emeralds* is commended for its miraculous vertue of stopping a Looseness.

I Answer,

I Answer, That it is not the *Emerald*, which is the sole cause of this Effect, but its being impregnated with Spirits and volatil Salt of Urine, which being very detergent, and almost as adstringent as Alume, do principally work that Miracle, as you call it; for digest its Powder with any other *Menstruum*, and its Operation will vary: Or abstract the Tinctures of any other Stone or Mineral Earth, (provided they partake of no noxious quality) with the same *Menstruum* of Spir. of Urin, and you will assuredly find the vertue to be the same.

Thus much touching their Intrinsic vertue: As for their External Effects, they are more certain and evident.

I. They do clarify the sight through their Lustre and splendor, by obtending the optick air. They do cheer the visive spirits by moving them gently, and as it were quavering upon them through their flashes and glisterings of Light. This is very true; for when you look suddenly upon a great Jewel, the sparkling of it will immediately quicken your eye-spirits, and as it were by consent cheer you. The same effect we do plainly perceive in our selves, when we come suddenly out of a dark Room into the Sun-shiny Light; wherefore I say the production of stones are ordained by God for to remain entire, and to please the eye by being lookt upon, and not to be broken into pieces and spoiled, when they are become scarce worth a Bodel, whereas before their value was of a great price.

Before I leave this Subject, I will only insert a word touching the cause of their glistering and splendor.

A *Carbuncle*, and particularly a *Pyrope* is alone said to shine in the dark, although *Sennert.* in his *Phys.* doth ignorantly deny it. The cause of its actual light in the dark is an actual flame kindled within the body of the stone, and there remaining *Catohized*, whose Light is further intended by a Reflection upon the thick waterish parts of the stone, and glisters through its refraction by angles adherent to the matter and dividing the intrinsic Light. The same, to wit, reflection and refraction, is also the cause of the shining and glistering light of the other most precious stones.

VI. Among the less precious stones, the *Bezoar*, or as the *Persians* call it, *Pa-Zahar**, a word compounded out of *Pa*, against, and *Zahar*, Venom; that is, a stone against all kinds of Venom or Poysons. But we here in these parts have a way of commending a thing far above what it is esteemed beyond Sea, and Quack-like, of

* The beast
it self wher-
in it is

found they
call *Paxan*.

* And in the Island *Vaquas*, near the mouth of the Gulph of *Cambaia*, likewise in the Country of *Pan* near *Malacca*.

extolling it against all putrid and malignant Feavers, the Plague, Small Pox, Measles, malignant Dysenteries, and what not? There are many of these *Goat Stags* in *Persia* *, which are fed in Fields near a place called *Stabanon*, two or three daies journey from *Laza*, a great City of that Countrey. These Fields protrude a great quantity of an Herb very like to *Saffron* or *Hermoadtlys*, whereon those Beasts do feed, out of the subsidence and faces of whose juyce remaining in the stomach, the foresaid stone concreaseth, which doth very miserably torment their bodies: But if the same beasts feed upon other mountainous herbs, this stone doth happen to dissolve, and comes away from them in small pieces. Now, that a stone engendred out of an unwholsom and poysonous herb should work such Miracles, doth by far exceed the Extent of my Belief. Moreover Physitians are very conscientious in dispensing the dose of it, imagining that 5 or 6 Graines must be sufficient to expel all Malignancy out of the humoral Vessels through a great sweat; but I have taken a whole Scruple of it my self, to try its vertues, and found it only to lye heavy at my stomach, and that was all. Besides I have several times prescribed it to Patients, in whom I never could observe the least Effect of it. Supposing this stone were exalted to such faculties, there is scarce one amongst a hundred is right; for those Mahometical Cheats have a Trick of adulterating them, and so thrusting two or three one after another down a Goats throat, they soon after kill him, and take the same stones out before witness, who shall swear they are true ones; for they saw them taken out.

The *Tair* of a *Stagge* doth expel sweat extreemly, and may be used against poysons and all contagious Diseases. *Horstius* commends it besides to facilitate hard Labour in Women. The *German Bezoar stone* is fained to excel in the same faculties that were ascribed to the *Oriental Bezoars*.

Piedra de puerco some six or seven years ago had acquired a fame, through the false imposition of a knavish Jew, of excelling all other stones in vertue, insomuch that there was no disease, but would give way to it. This Jew sought all the means imaginable to set out the vertues of the said stone, that so he might intice some one or other to buy it from him at a high price. It fell out (as the learned *Dr. Bate* related to me) accidentally, that he came to one *Mr. M. N.* house, whose wife had some hours before taken a vomit (I suppose it was a Dose of the *Infus. of Croc. Metal.*) against a double inter-

mittent

mittent tertian; The last vomit made her very sick, as usually it doth: The Jew imagining her to be in an Agony, ready to give up the Ghost, called in great haste for a glass of Wine and infused his stone in it for a moment or two, then gave it to the Patient, perswading her it would stay her vomiting (which had then already stayed of it self; for the operation begun to tend downwards) and infallibly cure her of the ague. She drunk it off and her vomiting staid, (as I told you of it self) and her sickness ceased withall, because the vomit had done working; her Ague left her because she had discharged the continent cause of the disease by her vomiting. Immediately this stone was cried up for curing a woman like to die, and for taking away her Paroxisms or fits in an instant. Soon after one bade him a hundred pounds for the stone, but as soon again flited it, when he heard the case stated by a Physitian. Even so is the Vulgar through the forwardness of their belief cheated and deceived every day by every Quacks Medicine, among whom some pay dear enough, and oft purchase it with no less than the loss of their lives. This stone is good for nothing else but for curing the yellow Jaundise, and particularly against the *Cholera* or Cholerick passion, which is very frequent amongst the East-indians, who usually take the infusion of this stone to appease it.

Pearls are accounted for the greatest cordial in the extreamest weakneses, and to have an alexipharmacal vertue against all putrefaction, Venome, and the Plague, and to chear the mind; all this is to be apprehended no otherwise than I have described the same properties to be imputable to the most precious stones.

The *Alectorite* is thought to encrease courage, raise lust, and quench a great drought, if a man do but carry it about him: but this is fabulous.

A *Bufo*nite is praised for a present Antidote against all poysons, inso much that some do assert it to change its colour when ever a venomous draught is present. *Casp. Bauhin.* doth discourse very superstitiously upon this, the Bezoar, and other stones, and adds (I doubt) something more of his own than ever he tried, nevertheless I should be loath to confide upon it.

A *Chelidony* is said to cure Convulsion fits in Children if only worn about their neck; but it is hard to be believed. The two long stones and the throat stone of a Carp cure convulsion fits; the triangular stone extends its vertue against the Collick.

Crabs

Crabs eyes are cooling, drying, detergent, discutient, break the stone of the kidneys, dissolve blood bruised within the body, and are good in a Plurisie, Prytick, and in the Collick. Besides, they are used to cleanse the Teeth.

A *Sourite* is said to be an Antidote against all poysons.

A *Limace* stone is used against the Prytick, and consumption of the Lungs.

Perch stones are taken to break the stone of the kidneys, and to cleanse the reines; externally they use them for dentifrices and the drying of wounds.

* I have wittingly omitted the inferring the *Drac-nite*, as being dubious whether any such be in nature.

The *Eagle stone* is by some believed to further labour, if tyed to the thigh, and staies it, if tyed to the arm. *

Coral is cooling, drying, and adstringent: It comforts the Heart, Stomack, and Liver; it purifieth the blood, and is good against all kind of malignant Feavers, the Plague and Poyson; it cheers the mind, (but that is doubtful,) stops a Gonorrhœa, *Menstrua*, and all loosenesses; it prevents Convulsion fits in Children; outwardly it heals Ulcers, and brings them to a Cicatrix; it dries up the rheumes of the eyes. *Paracelsus* doth madly use it for an Amulet to prevent being bewitcht, or ridden by devils, Lightnings, Frights, Convulsion fits, Melancholly, and Poysons.

Cry stall is adstringent, good against any looseness, or abundance of flowers in women; it is further commended for conducing to the abundant increase of milk; it breaks the Stone, and dissipates any tartarous matter; whence it is used against the gout.

The *Blond stone* is of a cooling, drying, and restringent nature; it stops the spitting of blood, and binds the belly in a bloody Flux, or looseness; externally it cures the ulcers and rheumes of the eyes; it consolidates the ulcers of the Lungs.

The *Galactite* comforteth the Infant in the Mothers belly, increases milk, and externally cures Ulcers and Rheumes of the eyes.

The *Marble stone* is only used for building, and to cut Statues out of it.

The *Ophite* internally breaks the stone of the kidneys; if tyed to the body, it cures the Head-ach, and preserves the body from the Plague: there are Cups made out of it, whose liquor infused in them they say expels Venome, cures all Agues and Consumptions. The stone warmed and applied outwardly cures the Chollick, Pleurisie, Gout, Stone: all this is but fabulous.

The

The *Lazul stone* purges Melancholly, hence cures all melancholly diseases, viz. a Quartan, Falling-sickness, Apoplexy, all diseases of the Spleen. It is hung about Childrens necks for to prevent frights, and to strengthen their sight; women wear it about them to prevent miscarriages.

An *Armene stone* is commended for the same vertues against the same diseases, but is counted more efficacious.

The *Nephritic stone* breaks the stone of the kidneys if only tied to the arm; this seems to be dubious.

The *Judean stone* is said to provoke Urin instantly, and to break the stone of the kidneys.

The *Leopard stone* is used for the same intent.

A *Tophe* is of little or no use in Physick.

A *Pumoise* is cooling, drying, and adstringent; it gently mundifies Ulcers, and particularly those of the eyes, and perduces them to a cicatrice; it serveth besides for a Denrifice.

A *Sponge stone* is used against the stone of the kidneys, and against the Kings evil.

A *Rock stone* serves only for building.

A *Flint* is the great preserver of fire; it provokes urin above all other things if oft heated red hot and quenched in white Wine.

An *Emerald* is of little use in Physick, except in Chymistry; its tincture precipitates and fixes Mercury in a moment. The Glasiers make use of it to cut Glasse with it.

The *Amianth* resisteth witchcraft; externally it is detergent and cures the Itch; internally, if dissolved with a little sugar in *Aqua visa*, it cures women of the Whites.

A *Chalck stone* is fiery, and knawing, and in length of time burns a crust.

The *Ostiacolla* is internally and externally used for to conglutinate broken bones.

Talck we have spoken of before.

The *Glass stone* doth whiten womens faces, and maketh them look smooth.

A *Calaminar stone* is drying, detergent, adstringent, farcotick and cicatrizing.

VII. Before I close this mineralogy, I will but name the kinds of mineral earths: viz. *terra sigillata* (so called because it is usually sealed,) which is either Turkish, being sealed with Turkish characters, and

and is sold to us for *Terra lemnia*; or of *Makha*, sealed with the stamp of that Island; or *German*, which comprehends two kinds; the one being of a clayish colour is found about *Triga*, a Town in *Silefia*, prepared and sealed with their seal; the other is of three colours, White, Ash, and Red, and sent from a place in *Wetteraw*, known by the name of *Terra Wetteracensis*, or *Lubalcensis*. All these earths are drying and restraining, resisting putrefaction, dissolving bruised blood, moving sweat, and Cordial. These virtues depend upon a subtil spirit, which is permixt through the said earths.

Bole armene is a red kind of earth, brought hither from *Armenia*; it is also found about *Wittenberg* in *Germany*. It is drying and adstringent; hence stops all fluxes of blood, loosenesses, womens *menstrua*, and expels putrefactions.

Marle is a kind of fat earth, inclosed within great stones: internally it dissolves bruised blood; externally, it proves adstringent, sarcotick, and cicatrizing.

Red Chalck is commonly known; it is adstringent and empla-
stick.

Oaker is much of the same nature. *Red Chalck* is detergent and adstringent.

Jappan earth is of a purple colour, here and there speckt with white specks, and of an austere taste; it is commended for drying up Catarrhes, and strengthening the brain, if held in ones mouth.

Tripolis is a kind of earth of a deep yellow, good for nothing but to scour brass Kettels.

Dioscorides and *Galen* do make mention of other earths, as *Terra Samia*, *Melia*, *Terrachia*, *Cimolia*, *Selinusia*, *Eretria*, *Phigitis*, and *Ampeliis*, but their virtues being much inferior to those foregoing, they are little taken notice of by Physitians of this Age.

Among these earths we must not forget that whereout Porcelaine Dishes are made: there are three sorts of it, The one is of a transparent green colour, like to a *Jaspis* or an *Emerald*, yielding to neither in price or beauty, and is alone to be bought in *Bengala*, *Guzerate*, *Decan*, but at an extraordinary rate. The other is of a transparent white colour, like to Crystal, and is artificially made up out of a certain paste in the Island *Cerge*, near the mouth of the *Euphrates*. The paste consists out of Oyster shells, and Egg-shells of some birds, called by the Inhabitants *Teze*, and *Beyde* &c of many others, which being stampd and mingled with some other materials are buried under

der ground, where they are to lye forty, fifty, or sixty years long ; Parents shewing their Children where such a mixture was laid, who at the time of its perfection and maturity do take it out and make Dishes or Pots of it. The third sort is of a Pearl colour, but somewhat more dusky, and is made out of a certain white earth in the great Province of *China*, which being well cleansed, sifted, mingled, stampd, and duly prepared, serveth them to make Pots and Dishes out of.

For a Corollary I will insert my sense upon *Libavius* his mineral flesh, which he in his *Singular. part. 1. fol. 252.* infers to be very possible. I shall add but one Argument : Earth we observe (supposing it to be somewhat below its Surface (destroyes and consumes all kinds of flesh, as appears in dead bodies buried. How then can she be thought to conceive apt matter for such a vital substance ? For living creatures are generated no where, but where the heat of the Sun may reach in such a measure, as to stir up, mollifie, and vivifie the substance conceived. Nevertheless near the Surface the aforesaid flesh is generable, as appears in many square Worms whose shape and form is in nothing differing from the supposed mineral Mole. *Theophrastus lib. de lapid.* describes mineral Ivory, and bones ; but you must not imagine these to be distinguished from stones, supposing them to be generated below the Surface of the earth ; However I will grant you, that real bones are generated near to the Surface budding out like sprigs ; for in *Thuringia* the same are oft found sticking out of the earth : And *Linscot* in his voyage to the *East Indies* tell us that the Inhabitants of *Goa* cast the horns of beasts killed for provision into a certain place within a mile or two from the Town, where they soon take root and spread themselves into branches.

CHAP. III.

Of the Loadstone.

1. *The various names of the Loadstone, and its kinds.*
2. *The Physical Essence of the Loadstone.*
3. *An enumeration of its Properties.*
4. *The demonstration of the first Mechanick property of the Loadstone.*
5. *The demonstration of the other Mechanical properties.*
6. *Of its nautical property. What is intended by the Poles of the Loadstone.*
7. *The division of the Loadstone into Circles.*
8. *An enumeration of the nautical properties of the Magnete.*
9. *A demonstration of the said nautical properties.*
10. *The cause of the deviation of the Compass Needle.*
11. *An Objection answered.*
12. *Cartesius his Doctrine examined touching the Loadstone.*
13. *The fabulous property of the Loadstone.*

I. **T**He Loadstone is otherwise called a *Magnete* from the first Inventor thereof *Magnes*, a driver of Cartel, who gadding his heard upon the Mount *Ida*, felt his slip-shoes, being fastened with Iron pegs, to stick fast to the ground, and his driving staffe, which was pegged at the bottom with an Iron peg, to stick fast likewise, whereat he was much astonished, but searching narrowly into the cause he found they were a sort of stones that held him.

The Greeks named this stone *Sideritis*, which *Pliny*, lib. 36. C. 16. derives from *σίδηρος*, Iron; and not without a just ground, it having a vertue of attracting Iron to it. Others knew it by the name of *Lapis Heraclius*, not derived from *Hercules*, or *Heraclius* the supposed Inventor, but from *Heraclia* a City of *Lydia*, where the best were found in great number. The Germans call it *ein seilstein*, or a sail-stone, because the Mariners sail by it.

This stone changes its name by the places, where it is usually found.

1. The

1. The Magnesian Loadstone is engendred about the City *Magnesia*.

2. An *Alexandrian* Loadstone is taken up about *Alexandria*.

3. It is found in *Echio*, in *Bœotia*.

4. The worst of them, being spongy and loose, are found near the Cape *Verlychi* in *Natolia*.

5. The best are those of *Æthiopia*, being the blower, heavier, and drawing Iron stronger. *Taisnierius* supposing them to grow in the bottom of the *Æthiopian* Sea, relates an odd story, that some Ships crossing the *Æthiopian* Sea, and bearing near to the Promontories should have been drawn to the bottom of the Sea, by some Loadstones taking hold of their Iron Pins.

II. Before we apply our selves to the enumeration of the properties of the Loadstone, let us in the first place search into its internal principles.

The Loadstone is (as it were) imperfect Iron, but not so near resembling it as Iron resembles Steel. It is between a Stone and a Metal, and therefore in a manner is not perfectly concocted. Its material principle is a loose earth rarefied by dense fire and incrassated air, being unequally mixt* and tempered. Its *forma ultima* is sometimes a compleat Metal like to Iron, other times like to a hard reddish blew stone. Both these have been found by many, not knowing what to make of them, which in all probability were concocted Loadstones. That they were Loadstones is evidenced by the remaining virtues, although but very weak of attracting Iron. Its body being throughout porous (that is loose and not very solid,) its intrinsic parts must of necessity partake of a certain figure as all porous bodies do, although in some more, in others less. Iron it self (as also a *Lyzard* stone) consists of intrinsic parts Cuspidally or Pyramidally formed, that is with streaks transcurring as it were into Pyramidal points. In *Alume* likewise we see its parts are Hexagonal; in *Cryстал* the same; and so in all bodies, although it is not alwaies visible, however appearing in our present subject. The cause you know is from the manner of exhalation & prurption of the airy and fiery parts, that have left it, and minutely do still leave it. Between these triangular pointings we do imagine insensible cavities or pores, through which those emanations do continually pass, and by whose figure they are directed to their passages outward; those I say are continuous and very potent.

* In the sense expressed in the Chapter of temp.

III. Now we have declared enough to demonstrate most of its properties, which I shall instantly enumerate. They are either Mechanical, Nautical, Medicinal, or fabulous. Its Mechanical property is of attracting Iron: Nautical, of inclining or moving towards the North Pole, and thereby of directing Mariners in steering their course, of which more anon; Medicinal, of adstringing and stenching blood. *Ætius lib. 2. terrabl. cap. 25.* gives us this account of its medicinal virtues: *The Magnete or Herculean stone hath the same virtues which a blood stone hath: They say that it doth assuage the pains of the Gout in the feet and in the wrist, if held in the hand.* This is fabulous, but if applied being mixt with other ingredients in a plaster, it doth really give ease in some kinds of Gouts. *Scrapio, lib. de simpl. part. 2. cap. 384.* commends the Magnete for curing Wounds, befallen by a venomous weapon; it is to be powdered and mixt with other Oyniments and applied to the part affected; besides, the Patient is for some daies to take a Dose of it internally untill the venom is purged away by stool. *Parey lib. 7. Chir. cap. 15.* attributes a very memorable cure of a bursted belly to it. *Fabr. Hildan. Cent. 5. Observ. Chir. 21. obs.* rehearses a famous cure luckily done by it by the advice of his Wife (at a dead lift I suppose) upon a Merchant, who was tormented with a miserable pain in one of his eyes caused by a little piece of steel that was accidentally peirced into it. All-kind of Anodynes were applied, but to no purpose, at last the Loadstone was thought upon, which he caused to be held near to the eye, whereby it was soon drawn out. The fabulous properties of this stone are of losing its attractive vertue by the apposition of a Diamond; of curing wounds at a distance, for which purpose it is added to *Bombasts* sympathetical oyniment; and of preserving youth, for which end they say the King of *Zeylan* causes his victuals to be dressed in Magnete Dishes.

I return to its Mechanical property, about which Authors are very various, some, as *Nicander, Pliny, Anton. Mercat. lib. 2. de occult. prop. cap. 1. Matthiol. in Dios. lib. 5. cap. 105. Encel. de re Metal. lib. 3. cap. 8. fabr. Hildan.* in the late quored observ. asserting it to attract Iron at one end, and to repel it at another. Others affirming the contrary, *viz.* That it attracts Iron from all parts, but by several impulses as it were, moving in several Figures, some being direct, others oblique. It is true in an oblique motion the Steel at the first impulse seems to recede, because of its changing its position towards

towards the Loadstone; besides this change the Steel also varies according to its diverse position towards the stone; we need not confirm the truth of this by arguments, the experiment it self (*viz.* placing small pieces of filings of Steel round about the stone), will give you a farther proof of it. Wherefore these forementioned Authors imagining the North part of this stone to be alone properly the Loadstone, accused *Pliny* of an error for affirming the *Theamedes* stone to reject Iron, which they affirmed was no other but the South part of the Magnete: Whether the *Theamedes* doth repel Iron or no, I know not, only thus much I know, that the description of it is altogether differing from that of the Loadstone; neither can I believe that *Pliny*, being so well versed in stones, should so easily mistake in this. Letting this pass, it is certain:

1. That in the North hemisphere it doth attract Iron most at its North part, and more directly; at the other sides its attractive vertue upon Iron is less potent and draws more oblique.

2. One Loadstone doth not draw the other, unless the one be more concocted than the other, and then it doth.

3. That a Loadstone capped with Steel attracts more vigorously than when naked.

4. That it draweth Iron stronger at some places than at others; at some seasons than at others.

5. That it attracts Steel more potently than Iron.

6. That it doth also attract Copper although but weakly.

7. That its Mechanick and nautical vertue is communicable to Iron.

8. That the Magnete loseth its vertue by rust; by lying open in the air; by moisture; by lying near to hot Spices, as the Indian Mariners, who transport Pepper and other Spices, do testifie; by fire; by being touched with the juyce of Garlick or Onions. That in length of time its vertue doth intirely exhale, leaving only a course rusty stone behind it.

9. That a Loadstone being intersected by a section almost perpendicularly incident upon the supposed axeltree of the said stone, and its pieces placed one against the other, so that the faces of each section may constitute a side of an acute angle, terminated by a common point of their South or North Pole, doth attract Iron more potently by far than otherwise.

IV. I should now begin to demonstrate the first effect of the Loadstone.

Loadstone through its proper cause, but before I can arrive to its solution, it will be requisite for you to know what is ordinarily meant by its North part. The said Part is otherwise by Authors termed the North Pole of the Loadstone, because it doth look or lye towards the North Pole of the Heavens; or of the Earth, because it tends withall downwards. Poles are (vulgarly) described to be the two extremities of an (*axis*) axeltree, about which a Globe or Wheel moves round. If so; then properly a Loadstone cannot be said to have either *Axis* or Poles, because according to the vulgar opinion it doth not move round. Wherefore the former denomination is improperly attributed to it, *viz.* the extreme central point of its tendency towards the Arctick Pole is termed the North Pole of the stone, and the opposite extremity is called the South Pole of it. Next remember out of the Ch. of *Coel.* that all bodies in their decoction do run off their temperament through streams or small mixtures of the Elements gradually deserting the decocting bodies, and taking their egress or fuming through their pores. These pores * tend most from the transcurent *Axis* towards the North. That its pores tend most towards the North is evident by its intrinsic parts within (as you may see when it is cut through) running variously intorted towards the North in streaks; these streaks are distinguished from one another through interjacent porosities, otherwise they would be continuously one. That the Loadstone emits fumes, is testified from its looseness and inequality of mixture: For all parts, (as I have shewed before,) that are unequally mixt, suffer a discontinuation of their mixture, because one Element being predominant, and having its force united through the said unequal mixture, must needs make way for its effumation, and afterwards break through by egressing fumes: but such is the Loadstone. *Ergo.* 2. That these fumes or *effluvia* do effumate through their Northerly pores, the experiment it self doth confirm to us; For we see that they attract Steel most at the North side †; besides, they usually rub the cross wires of Sea-Compasses at the North side, as being most effumous there. Thus much for the *3^m*, and part of the *5th*. Now for the manner of its attraction; and here it is disputed whether the Loadstone attracts Iron, or Iron the Loadstone. Hereunto I answer, That neither the Loadstone doth properly attract Iron, or Iron it: However since Iron is moved toward the Loadstone (but accidentally) by means of his *effluvia* or steames, therefore the Loadstone is said to draw Iron

* Suppose them to be transversely contorted inclining from East to West, & most to terminate obliquely into the poles, especially the North Pole in its North Hemisphere.

† That is in the North Hemisphere

Iron to it. 2. Iron doth (improperly) move it self to the Loadstone, being incited to the same motion through the steames of the Loadstone entring through its pores into its substance. The streams of the Loadstone are through their particular form and external shape or figure fitted to enter into the pores of Iron, which are in like manner fitted to receive the streams of the Loadstone; they being admitted do reperate the substance of Iron, or through their specifick penetrability do free the volatil parts of that Iron from the fixt ones, whence they do immediately through their fiery principle dilate and diffuse themselves towards that part of the Circumference, where they feel the continual effumations of the Loadstone yet more to unite them, which reeking out, and being further diducted by a continuation of succeeding parts, do draw the course parts along with it, as being still continually united to them. Or plainer, the said fumes of the Loadstone having entered the pores of Iron do immediately loosen the spirits of the Iron, which being dilated and united to the fumes of the Loadstone must needs cover a greater place, the want of which causeth them both to spout out at those holes, which are most patent; which must necessarily be those, through which the Magnetical fumes entered. This sudden spouting out must cause an attraction of the Iron, because the extrinseck air doth suddenly enter its pores on the opposite side, for to recover a place within the Iron which it had lost without by being driven back out of its place by the prorupting fumes: This sudden irruption of the air on the opposite side drives the Iron forwards to that place whence it was first repelled: This you will the better understand if you compare it with our discourse set down in the Chapter of *Local motion*, and of a *Vacuum*.

These steams of the Iron do effumate through all the pores, where the vertue of the Loadstone hath touched it, especially at the Center of opposition to the stone, whence they breaking out in great quantity, do draw the body of Iron directly towards the Loadstone: But if the objected Iron be defended by being besmeared with Oil or any other greasie substance, or by being dipt into water, it puts by and obtuses the Fumes of Loadstone. That the Loadstone doth effuse Fumes from it, is further made known to us,

1. Through its inequality of mixture and looseness of Substance, as I hinted before.

2. Either it must act, that is, attract at a distance, or else operate through

through steams; it cannot at a distance, that being only proper to supernatural Agents, and denied to all natural ones; *ergo* the last.

3. If you burn it, it will cast a visible blew sulphureous smoaky Flame.

4. It is not the Iron doth primarily effuse steams towards the Loadstone, because it is more compact, and less exhalable. Hence *Scaliger* might now have resolved his Doubt, whether the Loadstone drew Iron, or Iron it. Why these Fumes do exhale most towards the North, we have told you already.

Do not let it seem strange to you, that the emanations of this stone should reiterate the mixture and Temperament of Iron; it being common to many other bodies, although Authors are not pleased to take notice of it. The fumes of *Mercury* do open the body of Gold. The heat of the Sun opens the body of water, and attracts Vapours thence. Amber through its Emissives attracts Dust, Paper, &c. But of these elsewhere.

Why the stone moves steel variously according to its diverse position happens through the variety and obliquity of its Pores variously and obliquely directing its steames, and variously withal entering the Pores of the objected Steel.

V. The Reason of the second Property is, because two Loadstones being alike in mixture of body, and in Effumations cannot act upon one another; for *all actions are upon Contraries*. But in case the one be more concocted then the other, and in some wise dissembling in their mixtures, then doubtless the one will act upon the other, and the more concocted will attract the less. The cause of the third is, that the Emanations of the Loadstone being appelled and harboured in an extraneous body, as that of Steel, do with more ease and in greater smoakes (as I have said before) exhale out of it, and consequently attract Iron stronger, and work with a greater Bent towards the Northern Pole. Besides steel collects all the egressing steames of the stone, which being concentrated in the body of the said steel, and consequently received in greater quantity, must prove more forcible. The solution of the fourth is contained in the first. The Reason of the fifth is, because steel is purified from its grosser parts, which did before somewhat hinder the ingress of the Influence of the Loadstone, and cohibite the Ef-

fluvia

fluxion of the affected body. Sixthly, It attracts Copper or Brass, because of the likeness of its Pores and mixture to Iron, whence it doth aptly receive the Energy of the Loadstone. The Reason of the Seventh may be drawn from the Third. 8. The Magnete happens to lose its strength through Rust, because its *decoction* is thereby stayed, and its temperament subverted. Moisture, and its being exposed to the air do lessen its virtue, because the latter doth so much disperse its emanations, and accelerate its *decoction*; the former dissolves its temperament. Spices weaken its attraction, because through their heat they disperse and discontinue the emanating spirits; the like may be said of the juyce of Garlick and Onions. *Mercury* doth also destroy the temperament of the stone. Its virtue happens at last to relinquish it, through the natural course of *Decoction*. The Reason of the Eighth is, because the emanations do in that position easily joyn together, flowing in like course and figure from their bodies.

Many more Conclusions might be deduced from the Experiments of the Loadstone, whose solution may easily be stated from what hath been already proposed.

VI. Its Nautical Virtue is the great wonder of Nature to all Naturalists, to whom the Cause is no less stupendious. This Property is; whereby one part of the stone move:h towards the South, the other to the North. *Bodinus, Lib. 2. Theat. Nat.* proposeth an Experiment relating to this Property, somewhat different to what others have observed: *An Iron Needle* (saith he) *being gently rubbed against that part of the Magnete, where it lookt towards the North, whilst it stuck to the Rock, and placed in a Balance, doth place that extremity, which was rubbed against the stone, towards the North. The same virtue it exerciseth towards the South, if the Needle be rubbed against the South part of the Loadstone.* Neither is the strength of the Magnete less in its Eastern and Western part, although the stone cannot turn it self towards the Regions of the world, yet the Iron Needle can. What we have said cannot be understood unless it be experimented; for if you lay a piece of the Magnete upon a Board swimming in the water, and lay that side of the Magnete which looked towards the South before it was removed out of its natural Seat, against the side of another Loadstone, which before it was cut out, lookt likewise towards the South, then will the swimming stone flee to the other side of the Vessel in the water: If you should turn the North part of the Magnete, to the South part of the other Magnete

swimming in the water, the swimming part would suddenly come near and through a wonderful consent be both joyned to one another although the wood of the Vessel be between: The same will also happen if you put an Iron Needle into a Glass full of water being run through a piece of a Reed, and hold a piece of a Magnete in your other hand, one side of the Magnete will attract the Needle, the other will repel it. Thus far Bodinus. The last Property of attraction doth not appertain to this place, the cause of which may nevertheless be made clear to you by what is foregoing. The former touching its Vergency, is observable, if it be true; but I doubt he hath not made tryal of it: Besides, none else do make mention of it, which were it real, they would not omit the Observation.

That, which may next be disputed upon, is, whether the Loadstone turns to the South, or North Pole of the earth, or to the said Poles of the Heavens, or to neither.

In the first place, I wonder what they intend by a North and South Pole of the Earth. Those that agree to *Copernicus*, hold that they are the extreame points of the Axletree whereon the Earth doth move: Others, who deny Earth a motion, affirm them to be those points of the Earth that are responding to the Poles of the Heavens, that is, which do lie perpendicularly or diametrically under the said Poles. The former Opinion states the Poles of the Earth different from those of the Heavens. Among the latter, some have consented to believe the Poles of the Earth to be where the extremities of the Compass-Needles do diametrically point to the arctick and antarctick Poles; that is, where the length of the Needle is according to a right Line coincident with the imaginary axletree of the Poles of the world. The onely place of coincidence is concluded to be near the tenth degree beyond the *Fortunate Islands* (but that is false, since the same coincidence is also observed in other places,) from whence for that reason most do continue their mensuration of the Earths Longitude. But grant, the Poles of the Earth be at the points forementioned, why shall we apprehend the Loadstone rather to move towards the Poles of the Earth than of the Heavens. What? the Earth say they, attracts the points of the Loadstone to her Poles: An Absurdity, why should not the Earth through the same principle of attraction draw other terrestrial bodies to it? or what is it they intend by a principle of attraction? I had thought that among the wandering Philosophers nothing but Fire and Air had been attractive.

attractive. Moreover, did the Magnete alwaies incline towards the Poles of the Earth then it must be exempted from all deviation, which it is not; for in divers Meridians it hath divers respects to the Poles of the World, and consequently to those of the Earth. In *Nova Zembla* it deflects 17 degrees towards the East. In *Norway* 16. About *Neurenburgh* 10. So in the Southwest Climates its deviation is no less various. Wherefore after all this we must be constrained to assert the Magnete not to incline directly either to the South or North Pole of the Heavens or of the Earth, although, as I said before, its Vergency is towards the North and South.

The points of the Magnets Vergency are directly tending to the Poles of the Air: That is, The Poles of the Loadstone are directly coincident with those of the Air. You see its Poles are primarily neither perpendicular to those of the Heavens or of the Earth: *Ergo* its Poles do appropriate a particular situation. But before I prove their seat, it will not be improper to prefer the probation of the *in* of their Poles. The emanations of the Loadstone move circularly; *ergo* they must have real Poles or immoveable points, for a Body is incapable of a circular motion in all its parts. A real *Axis* is no less necessary: It being impossible to conceive two extreame immoveable points in a globous body without being fastned or continued to other fixt points, (which must likewise remain void of the same circular motion) and so on from one extreame point to the opposite extreame point. That the steames of the said stone affect a circular motion is evident, in that the continuous *effluvia* of all bodies convert themselves into a like motion. Doth not the thick smoak of Coales, of Gunpowder, of Boiling water, in fine of all things in the World turn themselves round in the open air? What is it you can cast up into the air but it will incline to a circular motion? Do not those little Atoms, that are seen by us in the Rayes of the shining Sun (the same which some Author is pleased to term light it self, probably because the Sun through its reflection and refraction upon them engrosses its light, so as to render them, to be light glistering bodies to the eye,) make choice of a turning and winding motion? Which if so, what reason is there to move us to detract the said motion from the continuous steames of the Heraclian stone? Authors I remember, as *Gilbert, Cabens, Kircher*, and others are accustomed to pronounce the Loadstone to contain a

collection of all the properties of the Earth in her, and reciprocally the Earth to partake of the qualifications of the Loadstone, but without reason: Nevertheless I may justly set down that the Loadstone is enricht with all the dignities and vertues of Fire and Air; For as Fire and Air attract, move circularly, are diffused to the periphery, even so doth this stone. Here we may equally imagine *Poles, Axis, Polar Circles, Aequator, Meridian, Horizon*, a common and proper motion, &c.

VII. I shall begin with its Poles, whose *Axis* in most places intersects the Axis of the fiery Heavens into oblique angles, which in some Climates happen to be more or less obtuse, or acute, except that about the tenth degree beyond the Fortunate Islands, and in some few other Meridians its Axis and Poles are coincident with those of the Firmament. The stone may be justly compared to a Planet, which as it doth in some stations of the Heaven seem to be eccentric, in others concentric, so this may be termed eccentric or concentric, or rather conpolar and expolar. Its greatest expolarity or declination from the Poles of the Firmament is by Mariners apprehended to be extended to seventeen degrees. Dr. Gilbert makes them up 23. that is within 30 min. equal to the greatest declination of the Poles of the Zodiack, but he omits the proof. Its Center is the body of the stone, about which the steames move round, like the Wings of a Mill do rowl about their Axeltree. Its polar circles may be conceived to be those, that describe the distance of the Poles of the stone from those of the Firmament and of the Air. The *Aequator* is the middle circle imagined to divide the Orbe of the steams into two equal parts, viz. of North and South. It acquires a new Meridian in as many places as its Poles vary in their declination or ascension. Its Horizon is the Circle equally dividing its upper Hemisphere from the lower. Next we will propose certain Theoremes of the Compass Needle.

1. The Mariners Needle, if gently rubbed against the Magnete throughout its length, and especially about both the points, doth imitate the nature of it, particularly of attraction, and of inclining towards the North and South.

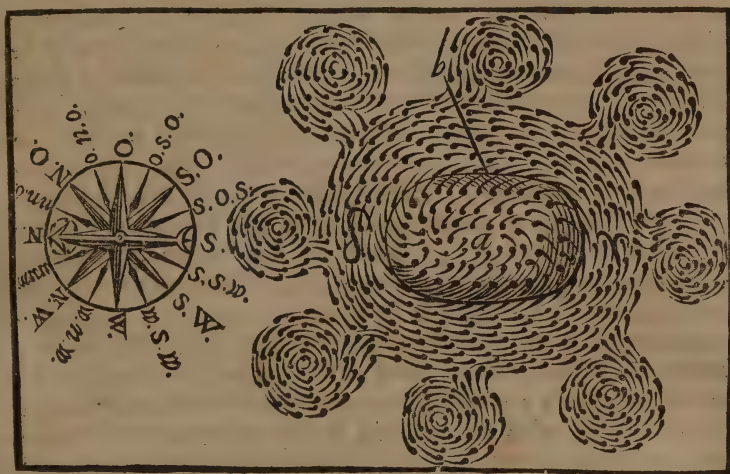
2. If the Needle be touched throughout its whole length it doth tend Northwards and Southwards with more force than if only rubbed at one end or point.

3. The Needle being only touched at the South end will only

in the Meridional plage incline towards the South; and if at the North point, it inclineth to the North in the Septentrional parts.

4. The Needle being rubbed about the middle doth incline towards the North and South although very weakly and slowly.

IX. These Theorems, together with the foregoing ones, we shall instantly endeavour to demonstrate. You must observe, that the motion of the emanating fumes of the Magnete is from East to West, and from West to East, and consequently its Poles or immoveable points must be North and South, as you may more plainly understand by this Scheme, where *a* is mark for the South Pole of the streames, and *b* for the North, *γ* for East, and *δ* for the West.



That the Magnete moves circularly in the manner aforesaid is evidenced by its circular attraction; for small pieces of Steel being placed about it are all obliquely attracted and forced to it, and not directly; which is an undoubted sign of the Stones circular motion.

2. These *Effluvia* issuing forth in great fumes are through a superabundance protruded into small bodies of steames, which through an overforcing impulse of the air, do as it were reverberate & move back again, but circularly towards the stone; (like as we see thick smoaks

do

do in a Chimney) still reserving their naturall motion from East to West. Wherefore it is through their circular motion that Steel is impelled to them obliquely, and through their reverberating impulse it is forced directly to the body of the Loadstone. Likewise the extreme part of the Compass Needle, being impregnated with the steames of the Magnete, which in the foresaid manner affecting a circular motion from East to West make choice of the extreme point of the Needle N, for one of its Poles, viz. its North Pole, which necessarily must remain immovable and look towards the North, supposing its motion to be from East to West. But if those steames were rowled from South to North as *Cartesius* imagined, then the Needle would constantly be shaken by a motion tending upwards and downwards, which it is not. To the contrary we see, that the said Needle is very inclinable to move Eastward and Westward, if but lightly toucht because of the steams moving from East to West, and from V West to East; for the motion of the Needle excited by a conqassation moves circularly in raising it self and moving towards the East, and thence depreessing it self and returning to the V West. 3. How can it be rationally conceived, that these steames should rowl from South to North since they cannot move the Needle that waies, it being fastned at the middle? 4. Hence you may be resolved, why the Needle being only toucht at one extremity doth tend Northwards with a greater force; because its rowling requiring a freedom of circulating Eastward and Westward, fixes the point Northerly, as being one of its Poles. Besides this motion obversing about its extremity urgeth a greater force upon the whole Needle; because there it and all other bodies (viz. at the extremity) are the weakest and least potent to resist. Likewise the same Needle being affricted at its Southerly part in Southern Regions Verges to the South (because of the Southern Pole of the air,) as that of the North point to the North in Northerly Countries, because of its imitating the North Pole of the air.

But if toucht about the middle its Vergency is the same, although with less force, because the weight of the Needle doth most resist the impulse of the Magnetical *effluvia* at its centrical parts.

Next for the *Sim*, to wit, through what it is, that the Magnete together with the nautical Steel do accline to the South and North Pole.

Pole. Here take notice that the steames of our stone, consisting of predominating fire and air, do therefore also imitate the nature of both: Wherefore it being natural to fire and air, if detained from their Center, to continue a circular motion, and to move upon two Poles of North and South about an Axeltree from East to West, and from West to East, it cannot but it must also be the nature of all steams as being likewise detained from their Center to affect the same motion and in the same manner: For fire and air flowing from East to West like the Ocean, which hath also made choice of the same motion, do carry all igneous and aerial bodies along with them, as the said Ocean bears all swimming bodies with it. That fire and air obtain such a motion we shall in the ensuing Chapters evidently demonstrate. These Herculean steames are also assisted by the protrusion of the flowing ambient air, because they being continuous and cohering do give way to the airs propulsion: For if they were contiguous and their particles dishearing, they would scarce be moved by the air, but would break through. So that it is more than probable, that the steames move with the air Eastward. Besides, those *Miasmata* being aerial do of their own nature strive for rest against the earth, which causeth them to move circularly. Lastly, we are to evidence how the air may be assisting in moving the steames back from East to West about the Needle; for the air doth in our Hemisphere continue a westward flood; but this is easier enough.

All flowing bodies do whirl, when appealing against a body that lyeth or standeth in their way: As for instance, where you hold your finger in a flowing water or River, there the water whirls or moves round about your finger; or where there are heaps of gravel or sand lying in the water, there you see the like effect: Even so it is with the air, which being alwaies in a flood, doth whirl about any weighty body, that lyeth or standeth in its way: Wherefore then the flood of the air hitting against the weighty Iron of the Needle lying in its way doth turn and whirl round about it, and so doth withal impel the Chalibeat and Magnetical steames to the same course, whereunto they do also of their own nature seem to incline. Moreover, Iron wrought into a thin long shape, and insinuating moveably and lightly upon an immoveable sustaining point doth inclinatively turn its extremities towards the arctic and antartick Poles of the Air: The reason is, because its steames are led with

with the stream of the air, which ever tending from East to West doth convey the steames of Iron (although but weakly, because they do not emanate very copiously from it) westward, and consequently its Poles must then necessarily be coincident with those of the air. A Needle swimming in the water (but then it must be still and thin) doth obvert it self to the same Poles; the reason is evident. Supposing that those steams did cease, and were quite exhaled, nevertheless would a long piece of Steel, insinuating lightly upon a sustaining immoveable point be caused to stick out its Poles North and South, because the air moving in a great, swift, and full steame enters the pores of the steel, and drives it cross or long waies; just as we see in a River, which carrieth a boat or any long piece of wood (as a Mast) being adrift, athwart or with its cross sides against the stream, and points its ends to the borders of the said River, which being (as it were) immoveable in respect to the cross drift of the Mast are instead of its Poles.

* To wit
most in its
lower re-
gion.

X. There wants yet the inserting of the cause of the deviation of the Mariners Needle: Which being accidental to it, happens through terrestrial and aqueous bodies condensing and incrassating the air *, whereby they do somewhat stop and retard the airs swift course only in its lowermost Region, which being retarded there makes an obliquity in its stream, since the other part of the air flowing in the second and third Region is forced to leave the lowermost streams a little behind, which makes the *Effluvia* of the Needle and Loadstone choose another Pole. So then about the Fortunate Islands the lower Region keeps touch with the others and therefore is conpolar, rendring the *Effluvia* of the Stone and Needle likewise conpolar. The reason is, because the air being very thin there, is not thick enough to retain any gross bodies, such as might hinder its course. Besides, that Climate being temperate and but little infested with heat is not so much obnoxious to the imbibition of Vapours or exhalations; neither is it subjected to receive any dense *minimas* falling down from the Cœlestial Poles, which do likewise retard the inferiour Region of the air. Under the Line, and within some degrees of it the air is likewise retarded by being discontinued below through the torrid *minimas* raining down from the Heavens and reflecting there, whereby it is compelled to be expolar in a degree two or three, whence also the Needle varies in the same number of degrees. About *Neurenburgh* the air

air in its lower Region is retarded near 10 degrees, and consequently differs in the distance of its Poles from those of the 2^d & 3^d Region in 10 degrees. In *Nova Zembla* 17. and very probably the further Mariners steer to the Northward the more degrees they find their Compass Needle to linger, because the more remote they go from the universal flame *, the more they find the air condensed and incrassated with earthy and watery *minima's*, whereby it is slowed in its fluor. And doubtless directly under the Poles of the Heavens the inferiour Region of the Air is altogether immoveable, and consequently its Poles must likewise be admitted to be at the same places. Further, these deviations of the Needle do signify the Altitude and declination of the Poles of the air, which altitudes and declinations are to be conceived nothing else but the degrees of the Airs retardation and acceleration in the inferiour Region, or the degrees which the superiour Regions of the air exceed the lowest in swiftness of motion, which various excess of Degrees seems to us to make choice of sundry Poles, but in effect doth not, it hapning through nothing but through the airs addensation.

Against what I have here proposed may be objected, That although granting such a motion to the universal tract of the air, yet it is dubitable, whether the air being separated from its whole body, and included within the limits of a Compass box doth continue the same motion; for water contained in a Porringer, and separated from its elementary body doth cease imitating the course of the great Ocean; likewise Pools and other standing waters desert that actual motion, which, if united to the Ocean, they would reserve.

Hereunto I give my answer, 1. That water in a Porringer, Poole, or Lake striving no longer for a Center, (for it enjoyes one there) doth not move downwards of it self, or is thence circularly reflected as water is, when it is deprived from its Center; wherefore that motion downwards, which is in the water in a Porringer, Lake, or Pool, is not caused intrinsically through a bent for a center, but by an extrinsick impulse of the air striving downwards for its center, and meeting with thick water, which it cannot easily pass, it bends and forceth the stronger upon it, that so it may give way. But the air in a Compass box is still detained from its center, especially by the intercurrent emanations of the Needle, about whose * extre-
mity both air and Magnetical steames move circularly together, ^{Namely, of the Needle.}

as upon one of the Poles. More than all this, the air within the Box is still continued to the whole tract of the air, whereby it is assisted and furthered in its circular motion : Whereas water is discontinued from its intire body.

But you may instance, That the Box together with the glass atop doth interrupt the continuation of the air within the Compass from its Elementary body without ; or if that did not, certainly the whole Compass Box being thrust deep under water would, and nevertheless the Needle would point South and North.

I answer, That a thousand glasses or boxes would scarce be sufficient to hinder the communication of the air, since they are all pervious : Yet I cannot but grant that the water may ; which if it doth, it doth only diminish the strength of the Needles Vergency, but doth not quite abolish it ; unless the air within begins to be incrassated by water entring in vapours, and then its circular motion and consequently the Needles Vergency is quite lost and abolished. Wherefore I conclude, That the air in the Box, although under water doth continue in a circular motion (because of its detention from a center,) untill it is incrassated by water.

XII. But before I come too near to the conclusion of this Chapter, let me take the leisure to balance what *Cartesius* sets down upon this matter. After the enumeration of the properties of the Magnete, he observes that there are striated particles, that are sent down from the South part of Heaven, and bowed quite into another kind of shape, different from those that rain down from the North ; whence it is that the one cannot enter into those Channels and passages, which the other can. He further observes, that the South particles do pass directly from their seat through the midst of the earth, and when passed return back again with the air that is cast about the earth, because the passages through which they pass are such, that they cannot return back again through the same. The like is to be understood of those particles, that press through the earth from the North. In the mean time as many new parts as there do alwaies come on from the South and North part of the Heavens, so many there do return or fall back through the East and West parts of the Heavens, or else are dispersed in their journey, and lose their Figures, not in passing the middle Region of the earth, because there their passages are made fit for them, through which

which they flow very swiftly without any hinderance, but in returning through the air, water, and other bodies of the outward earth, wherein they find no such passages, they are moved with much more difficulty, and do constantly meet with particles of the second and third Element, by which they labouring to expel them are sometimes diminished.

Now in case these striated particles hit against the Loadstone lying in its natural position, then they find a clear passage and go through, because (he saith) a Loadstone is pervious in the same manner as the earth is, and therefore calleth the Earth also a Magnete.

The Poles of the Loadstone he states to be the middle points of its passages on both ends. That, which is the middle point between those passages, that are disposed to receive the particles descending from the North part of the Heavens, is the North Pole, and its opposite point is the South Pole.

But when the striated particles, that come from the Poles of the Earth, hit against the passages of the Magnete lying arhwart, then they do by that force, which they have of persevering in their motion according to right Lines, impell it untill they have reduced it to its natural position, and so they effect that its South Pole (provided it be not detained by any external force,) turns towards the North Pole of the Earth, and its North Pole towards the South Pole of the Earth: Because those particles that tend from the North Pole of the Earth through the air to the South, came first from the South part of the Heavens through the midst of the earth, and the others that return to the North, came from the North: Here you have the chief of the forementioned Authors fanſie upon the demonstration of the properties of the Loadstone. In the first place, how can any one probably conceive, that there are striated parts sent down from Heaven; for consider the immense distance, (which he agrees to) the interposition of thick clouds filled up with dense exhalations, and the continuous depth of the air. Is not the air potent enough to dissolve all bodies contained within its bowels, doth it not dissolve the thick frozen clouds into snow, hail, and thick rain? Doth it not dissolve the coagulated exhalations of the earth, that are so tenacious? Much more those striated parts, which he himself confesses are dissipated at their return through the force of the ambient air, & that in so short a time & passage. Why should

these striated particles descend more from the polar Regions of the Heavens, than from the East and West parts? Are not the Poles of the Heavens immoveable, of the least efficacy? Are not those parts of the Firmament alwaies discerned to be clearest, and most freed from obscure bodies? Is not the North and South air so much condensed and congealed, that it is impossible for it to give passage to such subtil bodies as the pores of the Magnet do require? I say impossible to subtil bodies, because they need force to press through; and so much the more, because they are discontinued. But had our Author asserted them to rain down from the East and West parts, where the air is thinnest, and less nebulous, and where the Cœlestial bodies exercise their greatest influences, it would have deserved a freer reception; but then his *Chimera* would have been rendred monstrous, and unfit to explain the reasons of the Magnetical vertues.

The south streaks (saith he) are intorted in a form different from those of the North: whence had he that news? what? Because one Pole of the Magnete inclineth to the North, and the other to the South, therefore these streaks must needs be sent down from the North and South: Is this a Mathematical Demonstration to conclude the cause (and a false one too) by the effect? A notion by far inferiour to those of the wanderers, and that which adds to this absurdity is to imagine that these streaks should retain their shape notwithstanding their continual and long grinding against the air in their descent, and not change their shape a hundred times over. Dost not a cloud, which must be supposed to be of a firmer consistency than those particles, make choice of a new shape every moment? But how much the more these small tender bodies? And that which is most absurd is, to propose that such a vast number or troops of these particles should arrive hither into our North Hemisphere from the South so obliquely without changing their shape; further he supposeth them to come bearing down directly through the Earth, and through the Magnete, which is impossible, unless it be in a right sphere; whereas we here are situated in a very oblique sphere, and consequently the Magnet is also obliquely seated here, wherefore it is requisite that these streaks should alwaies beat against the Magnet in these Regions obliquely, and change their shape very oft. But how monstrous is it to maintain these particles to flie through the Diameter of the Earth and water,

water, being bodies most dense, close, & thick in many places shutting out fire and air, being substances by a Million of degrees exceeding *Des-Cartes* in subtility; or how is it possible they should pass the most Icy and deep thick body of water? well, and yet through all this difficulty they should retain their shape; this is an *absurdum absurdissimum absurdissimum*.

The earth is pervious in such a manner as to fit the shape of the Cœlestial streaks: and were it so, certainly it moving about the Sun according to his assent must change its passages and so thwart the entrance of the Cœlestial subtilities.

As for the passages of the Magnete, we grant them to be numerously seminated through its body, but their shape is quite different. My time doth even weary me in making disquisition upon so disheveling and monstrous a *Chimera*; I should easier give credit to *Rablais* his *Pantagruel*, or the Fables of *Æsop*, than to so obtuse a phantasm.

XIII. There remains yet a word or two touching the fabulous property of this Stone, which you have described by *Famianus de Strada*, *Libavius* and others, viz. that two Loadstones, although at a great distance, do so sympathize with one another, that they move at one anothers passive impulsion, and that towards the same place; as, for two friends residing in different Countries, and intending to signify their meaning or desires to each other, they are only to make use of two steel needles, of an equal size, & to rub them both against the same side of the Magnete, and afterwards to place them in a Compass Box, and so turning either of the Needles to any Point of the Compass, the other is thought to obey to the same motion, whereby they come to know one anothers meaning, as having mutually at their last meeting agreed to impose a certain signification upon each point of the said Compass. Hence they deduce a Magnetical (or like to it) sympathy in curing of wounds, a sympathy in the affinity of blood, a sympathy between the guts and their excrements, between superlunary & sublunary bodies, between men and men, men and beasts, men and parts of beasts, men and plants, beasts and beasts, beasts and plants, some natural bodies and others: So that whereas formerly Philosophers used to excuse their ignorance by occult qualities, now having worn them out they recur to Magnetical sympathies. There is not a Surgeon or Apothecary so ignorant, but he will as cunningly find out a cause, whereby

whereby to explain the most abstruse effect of nature, and instantly tell you such or such an effect happens through a Magnetical sympathy, as the most learned Mr. Doctor. But is this the great advancement of Learning and Philosophy, which our Age doth so much boast of? Is it not rather a grand piece of impudence to propose such absurdities, and much more to give credit to them?

If Loadstones are subjected to such a necessary sympathy, then one Magnet being retracted to a certain point of the Compass, all must yield to the same point. But the consequence is ridiculous, *ergo* the Antecedence is no less.

2. This sympathy is either communicable through means of the air, or through it self without any intermediate body, and consequently a natural action must *agere in distans*: not the first; for it is impossible, that its steames should be conveyed to such a distance in their full vigour; not the second, that sounding absurd in the ears of all Naturalists. The other kind of sympathies I intend to treat of elsewhere.

CHAP. IV.

Of Life, and living Bodies.

1. *What Life is.*
2. *The Form of Life. Why Vegetables are generated no where but near to the Surface of the Earth.*
3. *The properties of a Vital Form.*
4. *The definition of Nutrition, and the manner of it. Whether food is required to be like to the dissipated parts.*
5. *What Accretion is, and the manner of it.*
6. *The manner of the generation of a Plant.*
7. *The manner of the germination of a Plant. A delineation of all the parts of a Plant.*
8. *What the Propagation of a Plant is, and the manner of it.*

I. **H**itherto we have proposed to you the nature of Earths, Minerals, and Stones, which are the lowest degree of natural bodies, and therefore do most of all resemble their predominating Element

Element in nature and properties ; the next degree to this is, wherein Vegetables or Plants are constituted, and through whose prerogative a more noble Essence and dignities are allotted to them, consisting in *Life, Accretion, and Propagation.*

The *life* of a Plant is its singular nature, through which it is nourished and accreased, and doth propagate.

As *Generation* and *Corruption* in a strict sense are only appropriated to inanimated naturals, so are *Life* and *Death* restrained to animated ones ; namely, to Plants, Animals, and Men.

Peripateticks seem to observe a twofold difference of *life*, viz. Substantial and Accidental. The former is taken for the principle of the vital operations ; The latter for the actions of life, as *Nutrition, Accretion* and *Propagation.* We here intend neither abstractly, but define the life of a Plant concretely, that is a living body, substance or plant, to be a being composed out of a Physical matter, specified by a distinct form from pure naturals, and through its Essence to be qualified to nourish it self, accrease, and to generate : Wherefore *Aristotles* Followers do justly condemn *Cardan. lib. 7. de subtil.* and *Cornel. Valer. Cap. 44. instit. Phys.* for maintaining life it self to be an action, that is a quality or property really distinct from its subject ; But withall stumble into no small an inconvenience in defining it to be an *Actus*, which is no otherwise distinguished from an action than a concrete from an abstract : So that in inserting *actus* they must mean an (*substantia agens*) acting substance, which if so, then an accident is not really distinguished from a substance, and a substance must be conceived to act immediately through her self.

Aristotle lib. de respir. describes life to be the permanſion or abiding of the vegetable ſoul with the heat. From which that of *Scaliger, exercit. 202. ſect. 5.* is little different : *Life is the union of the ſoul with the body.* Here the Philoſopher appears only to deſcribe life to be a duration, which is but an accident ; neither doth *Scaliger's* union ſignifie anything more. 2. They diſtinguiſh the ſoul really from the heat and body, which in the ſame ſenſe are identified.

The matter and form of life, of a living ſubſtance; or a Plant, are originally the matter and form of the Elements. That the matter of living ſubſtances is Elementary, there are few or none among the wandering Philoſophers but will aſſert it with me, yet as
for

for their form their great Master hath obliged them to deny it to be Elementary, and to state it to be of no baser a rice than Cœlestial. Give me leave here to make inquiry, what it is they imply for a form: Is it the vegetable soul, which *Aristotle* makes mention of in his definition of life? Or is it the soul together with the heat, wherein it is detained, which is accounted of an extract equally noble with her? Be it how it will, the soul is really distinguished by them from the matter and from the Cœlestial heat (here they take heat in a sense common with Physicians, for *Calidum innatum*, that is heat residing in the radical moisture) its subject, and acknowledged for a form. So likewise the heat (*Calidum innatum*) is diversified from the matter and from the soul, wherefore it is neither matter or form, What then? Their confession owns it to be a body Cœlestial, and therefore no Elementary matter. Were I tied to defend their tenents I should answer that there was a twofold matter to be conceived in every living body, the one Cœlestial, and the other Elementary: But then again one might justly reply, *That beings are not to be multiplied beyond necessity.*

They do answer for themselves, That it is to be imagined a tie (*vinculum*) whereby the soul is tied to the body. So then according to this Doctrine of theirs I should understand the vegetable soul to be immaterial, and of the same nature in respect to its rice and immortality with the rational soul; for even that is in like manner tied to the body by means of the *Calidum innatum*, and are both apprehended by *Aristotle* to be Cœlestial, of no mixt body, and really differing from their matter: If so, the vegetable soul must be received for immortal as being subject to no corruption or dissolution because it is Cœlestial and consequently a single Essence, without any composition, and to which no sublunary agent can be contrary. But again, how can it be a single essence since it is divisible, and therefore consisteth of a quantitative extension, and is a *totum integrale*? Such is their Philosophy, full of contradictions and errors.

In the next place I would willingly know, how this innate heat together with its primogenial moisture may properly be termed Cœlestial, since it is not freed from corruption and dissolution, whereas all Cœlestial bodies are exempted from dissolution, and therefore the Philosopher takes them for eternal?

Are not coldness and dryness as much necessary *per se* for life,

life, as heat and moisture? Are heat and moisture sole agents without coldness or dryness, or are fire and water sufficient principles for actuating life? In no wise, for as you have read, they are incapable of existing in one subject unless accompanied by air and earth.

II. Wherefore I say, That the form of life is spirits or subtilities of the Elements united in mixture and a just temperament. Spirits are derived from the word *spiro*, I breathe, as being bodies no less subtil than a breath. Their constitution is out of the best concocted, tempered, and nearest united parts of the Elements, in which parts the Elements embracing one another so arctly, minutely and intimately, do of a necessity separate themselves from the courser parts of the mixture, and so become moveable through the said course parts; they acquire withal a great force through the predominancy of fire condensed by earthy *minims*, and glued together by incrassated air. The force and agility in motion of the influent Spirits depends upon the compression of the weighty parts of the body, depressing the said spirits out of their places (because they hinder the weighty parts from their center,) which being through their incrassated air naturally gendred glib and slippery do the easier yield to slip out and in from one place to another.

The efficient of spirits is the universal external heat, *viz.* The Celestial heat, mainly proceeding from the greater mixt bodies contained within the heavens: For although the peregrin Elements contained within the earth are capable enough of uniting themselves, and constituting a mixt body through their proper form, yet they remain unable of uniting themselves so arctly, as thereby to become spiritous and constitute a living substance; wherefore they do stand in need of the external efficiency of the Celestial bodies, which through their subtil heat do accelerate their most intimate union, in uniting the internal heat (before dispersed through the parts of a body) to a center, whereunto they could not reach without the arct and firm adherence of some incrassated aerial and terrestrial parts, which here are yet more closely united into one, and refined from their grosser parts. Hence it is, that Vegetables are nowhere generated but where a sufficient influence may arrive from the Celestial bodies; and for this reason, the earth at a certain depth doth not harbour any living Creature, as any Vermine, or Plants, but only near to its Surface. The qualification

or gradual distinction of this heat partially effects the difference of living bodies ; for to such a Vegetable, only such a degree and qualification of Celestial heat is requisite, and to another another : and withal observe that this efficient heat doth not become formal, neither doth it unite it self to the intrinsic heat of a Plant, but exhales after the execution of its office ; The reason is, because it is in many particulars unlike to the internal spirit of a Vegetable, and therefore being unfit to be united to it mult consequently after the performance of its function expire.

The spirits predominating in fire reside in an incrassated air, the which being continuatd throughout the whole matter is the immediate subject, whereby the spirits are likewise extended throughout the same body, and are (although mediately) rendered continuous.

III. The properties of a vegetative form are to be moveable, forcible, actually warm, mollifying, attractive, retentive, concocting, expulsive, nutritive, accretive, and plastick. The two former I have touch'd just before: Touching the third, I say those spirits are actually warm, but not sensible to our touch, because their heat is of a lower degree than ours ; however we feel they are less cold (for in comparison to our warmth they are cold) than pure naturals, as Earths, Stones, or Metals. This befalls through their fire condensed, in such a degree and manner, that it kindles the least flame, whose greatest effect is but the remissest warmth. How fire mollifieth I have formerly shew'd : Besides, that which adds much to this is the incrassated air, whence its parts are rendred tenacious and cohering. Living spirits are attractive, but how ? Not as Novices have hitherto imagin'd through the fires egress and appulsion to a portable body, and thence returning as it were loaden with a burden : But through dissipating and feeding upon its incrassated air, which diminishing, other air ready prepared touching it succeeds and bends into its room, being impregnated with some parts of the exhaling fire, which it imports along with it. This new advening incrassated air you must conceive contains also some earthy *minima's* and condensed fire ready to take flame, through which it moves much stronger inwards. That air strives thus to enter into the cavities left by a precedent air, I shall make good to you in its proper place. Spirits are retentive through continuing their accidental attraction, & by means of their courser parts, which being extensive and

and tenacious are by the succeeding air blown up into the middle parts, where swelling must needs constrict the upper and lower filaments or containing parts. They exercise their concocting virtue upon the succeeding airy moisture, by melting its body, which done its purer parts succeeds the dissipated thickned air, because it is compressed upwards through the constriction of the weighty Elements. The grosser parts being left behind, as not being subtil enough to follow their finer, are expelled by the exhaling heat, which being somewhat condensed and corporeal is forced to drive the excrementitious parts of the incrassated air before it, before it can procure its egress, which is the manner of the spirits exercising their expulsive faculty: Here we need no muscels, nor alwaies right, oblique or transverse Fibres, or what not, to attract, retain, concoct, and expell? For what use could the vital flame of a tree make of them, since they cannot be extended and contracted into requisite shapes. The truth of all this I will confirm to you by the burning of a Candle, where you may in like manner observe one and the same flame attracting, concocting, retaining, and expelling its nutriment or incrassated air, namely, the Tallow, and doubtless Vegetables are not differing from these in exercising the same faculties.

The flame of a Candle doth attract the Tallow not by right fibres, or by fiery parts egressing and returning with their load; for that is contrary to the nature of fire, whereby it is diffused from its center, but the unctious parts adhering to the Cotton, and retained within those small *villi* of it, which being dissipated, the nearest adjacent parts of the Tallow do naturally succeed, not to avoid a vacuum, but because their parts are continued, which so being, one part attracts the other; besides those adjacent unctious parts being expanded are diffused by their ambient air compressing for a center into the cavities between the Cotton, where they are retained. These retained parts are concocted, that is dissolved by liquefaction, where only the subtiler and purer parts succeed the dissipated preceding ones, through means of the before said compressing air; the courser parts are elevated and expelled by the expiring fire into the form of smoke. The same may be instanced to you in the burning of spirits of Wine, wherein the same particulars are observable. Here I do with purpose leave out the principal part of this notion, whereby to demonstrate the motion of food to the parts, because I have reserved it (God willing) for another Volume.

IV. By these four actions *nutrition* is performed, which sounds nothing else but the conservation or maintenance of the vital form to wit, the spirits or vital flames in their matter, or being, by supplying them with new parts against the defect of the dissipated ones. In this definition you have set down the internal active principle of nutrition, *viz.* the vital form, spirits, or living flames, which according to your pleasure you may term *Anima vegetativa*, in contradistinction to *anima naturalis*, so that *anima* here is synonymous to a form or internal active principle: The subjective internal principle is the matter: the end, or rather the bent is to conserve the form in her matter; the action and means whereby, is generally by supplying it with new parts, particularly by attracting food or aliment, retaining, concocting it, and expelling the excrements.

As for the food, It is required it should be aerial and igneous, or like to the parts that are to be nourished; hence they say *Simile simili conservatur*; Like is preserved by like: Here may be objected the relation of the King of *Cambaia* his Son, who was fed with poysonous meats, in a manner that when he was grown up, his bloud or rather his skin was so intirely stayned with poyson, that flies sucking it immediatly swelled and dyed: And of a Girl, that was sent by an Indian King to *Alexander* for a gift, which being fed and brought up with poison killed the King alone by her looks.

The History of *Mithridates* King of *Pontus* is universally known, and of the Ducks of the same Country, that feed altogether upon poyson. The inference hence is, that poyson although unlike to the vital spirits (which at most times it doth usually destroy,) yet sometimes becomes a food to them. I answer, that it is no wise unlike to them, because it doth nourish them; possibly at its first eating, it might be unlike, and therefore it then making them sick was rejected by their natures; but they by degrees accustoming themselves to it, their spirits were gradually assimilated to it, and also brought to be poysonous, as appears by the History of the King of *Cambaia* his Son, and of the forementioned Girl.

Hence it follows, that pure Elements are insufficient for food, as likewise all other substances, that are not igneous and aerial, or such as are unapt of being converted into a flame. This resolves us that the Chameleon doth not live upon air, nor the Aquarels upon water, nor Toads upon Earth, nor Salamanders upon fire.

Accretion.

V. Accretion is an action of life, through which a living body is intended in form, and extended in matter. This action is performed by the same form, and the same nutriment, but the former growing more vigorous becomes through that degree of intention of vigour yet more vigorous, and the latter being more and more dissipated through the gradual intention of heat doth likewise gradually increase through a greater access of nutriment, than was dissipated. This instance may serve to make a further illustration of it to you: Focal fire doth accrease in form, (that is, intense heat) and in matter or extension of its quantitative parts by greater apposition of fuel; This fuel at its first apposition to the fire is not yet attracted or become a fit nutriment for it, before it succeeds the incrassated air by a continuation, and through an impulse of the ambient air, and then being attracted it is concocted, and its aerial parts are gradually adjoined to the former air, where its formal parts, to wit its latent fire being adunited to the form of the former fire doth accrease the former fire and form, which accretion must necessarily attract yet more nutriment, which nutriment acceding doth each time increase its form and matter. Even so it is with Plants attracting much nutriment, the which the gradual increasing of their form and matter doth dispose to a greater attraction, which again a greater supply of formal & material parts do necessarily consecute. But seeing that all Plants do accrease no further than to a determinate quantity of formal and material parts, it will not prove amiss to give the reason of it, which we shall do hereafter.

In order to a further explanation of this definition let us first shew you the *Homonymia* of accretion.

1. It is taken for an augmentation of number in naturals, animals or others: Thus a heap of Corn, of Beasts, or of Men is said to be augmented, because it is increased by access of a greater number of individuals of the same *species*.

2. It is strictly appropriated to the augmentation of an Element through the apposition of another Element, or of its own, namely to *rarefaction*; For example, Water is said to be accreased, when it is rarefied (according to my intention *attenuated*) by the apposition of air.

3. It is understood, for an accrease proper to living creatures, that is such, as is performed through an intossusception (as they vulgarly term it) of nutriment, whereby a body is increased throughout all dimensions.

4. Erroneously

4. Erroneously, for an accretion by adgeneration or apposition; so fire is said to accrete by apposition of fewel; but this kind of accretion is the same with that caused through rarefaction.

5. Philosophers intend it sometimes for an increase of vertue or perfection in a body, as of heat in a fire, or cold in a frost, whence they term it a virtual accretion.

6. For the accretion of material parts only, or of the Mole or body of a thing, wherefore it is vulgarly agreed to call it a dimensive accretion. To distinguish accretion, as it is treated of here, you are to apprehend it for the accretion of a Vegetable in matter and form, or as they term it both for a dimensive and virtual accretion.

Accretion is otherwise called *auction*, or *augmentation*, which notwithstanding in a proper sense do differ from one another in largeness and strictness of signification. *Auction* is common to all the forementioned kinds of accretion. *Augmentation* is restricted to that, which happens through apposition, but *Accretion* is only proper to living substances, or to such as is performed by an introreception of Elementary parts, and whereby they are extended into all dimensions.

Accretion comprehends in it all the kinds of motion, *viz.* alteration, *auction*, and Local motion: A Vegetable is increased virtually or in its qualities, and likewise the nutritive actions are performed by alteration: That it is related to *auction* the name and definition it self doth convince. Local motion is likewise necessary for the effecting of Accretion, because by its means the aliment is attracted to the central parts of a living substance.

By the precedents we may easily be resolved, whether a vegetable accreteth through a penetration of Dimensions, or by the admission of a *Vacuum*.

I answer through neither, but by the giving way of the parts, and their being extended by the succeeding aliment: Notwithstanding you may reply the doubt to remain the same still; for the succeeding nutriment is either received in a full body, or in an empty or void one: If in the former, then a penetration of dimensions must be allowed, if in the other a *vacuum* must be admitted.

I answer, That in one sense the nutriment is received in a *vacuum*, that is void of such nutriment as is to be next received, but not in a *vacuum simpliciter*, for it is replenisht with vapours, or air,

or

or excrements, which are procured by the advent of the nutriment, and so it is received in *pleno*.

2. Whether Augmentation be effected through extension of parts, or pulsion.

I answer through both; The first is requisite, because without it Accretion is impossible, since thereby a body is extended into all dimensions; Neither can the second be wanted, since the succeeding parts may be conceived to impel one another forward, and the formost of them to propel the preceding nutriment.

VI. The first and last of a Plant is its *first generation*, and its *last propagation*. By the first generation I intend the first rise and production of a Plant out of the Earth without being derived by propagation from any preceding Vegetable, or in one word its *semination*. Although by course of my method I ought to have treated of this before, yet knowing that the premitted notions would add much to the explanation of this matter, it did prevail with me to subjoin this to them. The earth we spy to be the universal Mother of all Vegetables, being within her self divided into several wombs, within which she is apt to conceive divers genitures or seeds, and retaining the same untill their perfection, she then casts them forth from her. I shall first make observation upon the *Wombs* of the Earth, next upon her *Conception*, then upon the *Protrusion* of her *Fœtus*.

The Surface of the Earth is divided into numerous Wombs of various Figures, and various dispositions of temperament, bigness, &c. The Wombs of the Earth that are destined for Vegetables, are small and narrow Cavities, formed by the transursions of exhalations and vapours, though their passage impressing that variety of Figures. These formed are actuated with a prolific heat (*Calidum*) consisting out of part of the heat of the through passed subtilities, and part of the influent heat.

The Cavities graven within are left rough, and close, filled up with air, or other thin substances, as vapours; these must needs be rough, because where ever we see the Earth excavated, it alwaies appears rough, which contributes much to the conception and retention of the seed or geniture, and so doth its closeness. These Wombs do not remain long ventous, without being gravidated with some spermatick matter, which is constituted out of the most subtil and active parts or spirits of passing exhalations, being so
 arctly

are knit and united into a subtil temperament of their Elements, that they might be termed volatil bodies, actuated most by fire and air. These spirits or volatil bodies cannot divagate without meeting with some moisture, which doth unite them and cohibite them into one body; nevertheless they continue in making their way untill they arrive to some Cavity, where they may be harboured (or else they may be stayed by so much moisture as may force them through their intumescence to raise a womb where they meet,) where being arrived they are immediately cherished and further actuated, united, and condensed by the close and cold temperature of the womb. This actuation conceives a flame, because through it the fire happens to be united, and thence dilated by the incrassated air, whose immediate effect is a flame; now being come to a flame they attract nutriment out from their *matrix* in the same manner as was set down before. The spiritous parts of this advening nutriment is united to the central parts of the flame, which it doth increase; its other parts that are more humorous and less defecated are conincreased by the lesser heat of the extreme parts, or a heat lessened through the greater force of the extrinick cold.

That which is worthy of inquiry here is, Why the heat or vital flame strives to maintain the central parts; moreover, this seems to thwart what I have inserted before, *viz.* That it is the nature of fire to be diffused from the center.

2. Whence it is occasioned, that the weighty parts, as the dense and humoral ones are expelled to the Circumference.

For solution of the first you are to call to mind, that the Elements in that state, wherein they are at present, do war one against the other for the Center, which if each did possess, this motion would cease in them; the fire then being now in possession of the Center contracts it self, and strives to maintain its place; nevertheless it doth not forbear diffusing its parts circularly to the circumference, because through its natural rarity it is obliged to extend it self to a certain sphere.

The reason of the second is, Because the igneous and airy parts being united into a flame and into a greater force do over-power the other Elements and impell them to the Periphery, where they being strengthened by the ambient coldness of the *Matrix* are stayed, and do concrease into a thick skin; by this also the internal flame

is

is prevented from dissipating its life, and the better fitted to elaborate its design, which is to work it self into shapes of small bodies, of several Figures, and of various Properties, and in those shapes to diffuse each within a proportion of other Elements likewise variously tempered. And so you have in brief a perfect delineation of the Earths conception and formation of Seeds, whose spirits being now beset with thick dense parts are *catochized*, that is, the flame is maintained in such a posture which it had, when it had just accomplished the *plasis* of the internal organical parts; or in some the flame may be extinguished through the near oppression by heavy parts, which * afterwards being stirred and fortified by an extrinsec heat relaxing its parts returns to a flame. Whence it happens, that seeds may be kept several months, yea years, without protruding their parts, but being committed to the ground, especially where the mild heat of the heavens doth penetrate, perfused also with a moderate moisture, do soon after come to a *germination*. The same may be effected by any other mild heat, like we see that many seeds are produced to a growth before the spring of the year in warm chests, or in dunged ground; Eggs are frequently hatched by the heat of an Athanor, or by being placed between two Cushions stuffed with hot dungs; Silk-worms Eggs are likewise brought to life by childrens heat, being carried for two or three weeks between their shirts and waistcoats, all which instances testify that the heat of the Sun is no more then Elementary, since other Elementary heats agree with it in its noblest efficiency, which is of actuating and exciting life within the genitures of living bodies; possibly it may somewhat exceed them as being more universal, equal, less opposed, and consequently more vigorous and subtil.

The time, when the Earth is most marked with *Matrices*, is in the Spring and Fall, because the astral heat is then so tempered, that it doth gently attract great quantity of exhalations and humours; neither is it long after before they conceive, the influences of the Stars being then pregnant in subtilizing and raising seminal matter.

The cause of the variety of Seeds and Plants thence resulting I have set down above, and withall why it is that (*Non omnis fert omnia tellus*) every kind of Earth doth not produce all kinds of herbs; but why herbs of the hottest nature are sometime conceived within the body of water might be further examined. In order to the

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solution

* To wit, the latent fire into which the extinguished flame was dissolved.

* Except
where it is
condensed:

solution of this Probleme, you must note that the seeds of such herbs as do bud forth out of the water, were not first conceived within the water as water, but where it was somewhat condensed by Earth, as usually it is towards the sides, where those Plants do most shew themselves; for water in other places, where it is fluid, is incapable of receiving the impressi^on of a womb, excepting only where it is rendred tenacious and consistent through its qualification with glutinous or clayish earth. And this shall serve for a reason to shew, that herbs germinate out of water, although they are not conceived within it *. The ground, why the hottest herbs, as *Brooklime*, *Watercresses*, *Water-crowfoot*, &c. are generated in the water, is, in that the spirits informing those Plants are subtil and rare, easily escaping their detention by any *terrestrial matrix*, as not being close enough by reason of its contiguity of parts; but water, be the spirits never so subtil or rare, is sufficient to retain, stay, congregate, and impell them to a more dense union (whence it is that such substances prove very acre and igneous to the palat) by reason of its continuous weight.

Next let us enumerate the properties of a vegetable Seed.

1. Is, to be an abridgment of a greater body, or in a small quantity to comprehend the rudiments of a greater substance, so that there is no similar or organical part of a germinated plant, but which was rudimentally contained within its seed.
2. To be included within one or more pellicles.
3. To lye (as it were) dead for a certain time.
4. To need an efficient for the kindling of its life, whence it is, that the Earth was incapable of protruding any plants before the Heavens were separated from the Earth, through whose efficiency, to wit their heat, living substances were produced.
5. To need an internal *matrix* for its production and germination, which is not alwaies necessary for the seeds of animals, as appears in the Eggs of Fowl and Silk-worms.
6. Only to be qualified with a nutritive, accretive, and propagative vertue.
7. To consist intrinsically of a farinaceous matter.

VII. The *germination* of a plant is its motion out of the Seed to the same compleat constitution of a Being or Essence, which it hath at its perfection. Motion in this definition comprehends the same kinds of motion, which Accretion was said to do; and withall

is specified by its *terminus a quo* the seed, and a *terminus ad quem* a perfect living being, that is a being responding to the goodness and truth of its formal and material parts. A Plant at its perfection generally consists of divers parts, whereof some are said to be similar, others dissimilar: The former are such as do partake of one matter, and one partial form, and are destined for one single action, use, or end as they call it. The latter are distinct from one another in matter, Partial form, action, or use; whence they are also termed organical, because two or more dissimilar parts being conjoined prove a convenient organ for performing a compounded action. The similar parts are either fluid or consistent; The first, being otherwise known by the name of *liquid*, are succulent, or lachrymal: The succulent ones are unctious or balsamick fluidities, contained within the venal porosities of Vegetables for their nutriment. That their fluidities are unctious appears by the breaking of a Vegetable and squeezing its juyce out, which doth manifest it self to be glutinous between ones fingers. The venal porosities are discovered by the humours pressed out of a discontinued plant, and appearing to proceed out of the orifices of long exill channels. The colours of these juyces are various, some delighting in a milky colour as Tithymal; Others in a dark yellow, (as *Celandine*,) waterish (as a Vine,) purple, green, and many others, which do all depend upon the diversity of temperament and degree of concoction. Lachrymal humours are fluidities proceeding out the pores of a plant through a *diemeseis*, or transudation*, pressed out either through the abundance of nutriment contained within the channels, or expelled by means of irritating external heat; among these some are more aqueous, concreasing afterwards into a gumme, others like Pitch changing into Rozin. The consistent or solid parts are either the fleshy or fibrous parts of a plant. The fleshy ones are the parenchymous substances of a plant. By parenchymous understand parts, which being fleshy and of an equal consistency are extended equally into all dimensions. Fibrous parts are like strings diducted into length, and seminated through the parenchymous ones for the firmness of the body, and retention of nutriment. These are most right ones, some few oblique, and as few transverse.

The *Medullar substance* is a similar part, being spongy, concreased within the innermost places of a plant out of a peculiar matter.

* Or by incision.

The rind or bark is a similar part concreated out of the grossest part of the material principle of a plant.

Dissimilar parts comprehend the root, trunk and boughs or branches.

The *root* of a plant is the part defixed within the earth, consisting most of fibrous parts, little flesh, and a rind, and destined for to attract and prepare the nutriment for the whole plant.

The *trunk* is the middle body of the plant between the root and the boughs, formed most out of flesh, some fibres, a vein of marrow, and a bark.

The *boughs* are the body divided into many dissimilar substances of the same kind. Sprigs are the same with boughs, and differ only from them as Diminutives.

The excrecent or abounding parts of a plant are the Leaves, Flowers, and Fruits.

A *Leaf* is an abounding dissimilar part of a plant, consisting of a loose and moist flesh, and tender sinewes, strings or fibres produced out of the courser and less concocted part of the abounding nutriment of a Vegetable.

A *Flower* is an excrecent dissimilar part, consisting of a smooth fine flesh, subtil fibres, and a thin pellicle, formed out of the finer and better concocted part of the abounding nutriment of a plant.

Fruits are excrecent dissimilar parts, containing stones or kernels, gores, flesh, and a skin, some, although but few, having fibres.

The excrements of Plants are either thick or thin: The thick adhere to the bark, and are worn off by the wind, rain, air, or are propelled by the succeeding excrements, which force the preceding to fall off. These are called the moss of a tree, whereof some is dry, sticking fast to the bark like bran, other is moister, ~~wet~~, and villous; the thin expires and vanisheth through the air.

Recremental or deforming parts are Knobs, Nodes, and Warts.

Knobs are hard recremental parts of a tree, some sticking out in the bigness of a head, or fist, some greater, others less; some being latent are also various in their extensions; others having a cavity within the knob, others not.

Nodes are plain hardnesses of a plant, and usually orbicular.

Warts

Warts are likewise swelling hard recremental parts differing from knobs only in smalness.

Thus far of the integral parts of a plant, which I thought necessary to premit; and thence to take occasion to explain their particular germination out of the seed, which continued in its *matrix*, or dimitted into another doth soon after either receive its flame a new by having its body opened, whereby the fiery parts return to an union, and being diducted by an increassated air, return to a vital flame, which the celestial efficient, together with the internal disposition of the *Matrix*, being perfused with a gentle and piercing moisture, and indued with a sharp heat do concur unto by relaxing, mollifying, rarefying, and attenuating the intrinsick parts of the seed.

I. The seed is relaxed by a thin piercing humour, or in short by increassated air, whereby the close parts are diducted, the heavy ones lifted up and balanced by other light ones; between every diduction or space between two diducted parts the flame doth vegetate and assume nutriment, being every where diffused throughout those spaces. The flame it self in the mean time inheres radically in the consistent parts like the flame of a Candle in its Wick or Cotton, into whose pores it attracts nutriment: Whence these flames being of an unequal and various intention, and their subjects of an unequal and various extension, do each according to their intention intend themselves and extend their subjects into a dayly accretion of parts, whereby in time they arrive to their just and definite magnitude, which is stented by the extreame expansion of their Radical or Spermatick solid parts, and greatest intention of the spermatick spirits: For the spermatick matter or the seed it self is of that nature, that being very close tyed through its spirits and radical moisture, and wicall intertext with terrestrial *minima's* is capable of degrees of extension and rarefaction, until it appells to the highest degree; within those degrees of extension and rarefaction it takes in gradually other matter, both solid, spiritous, and humorous, whereby it discovers its gradual accretion; not unlike to Gunpowder, which within its bowels contains much fire densely united, but oppressed and hindered from flaming through the saline parts; yet being stirred, excited, and somewhat freed from its said oppression, so as to reach to a flame, it accreases in body and flame by the access of the ambient air being permixt with a proportion

proportion of fire, which it draweth in for nutriment, untill it hath reached to the height of accretion. Whence you may plainly gather, 1. That the total vertue of Accretion lyeth hidden in the spermatick substance.

2. That the accretion of living parts happens through increasing their flame and extending their solid substance, and by being united to the radical ones. This observation contains the greatest secrecie of the art of Medicine, and is the sole *basis* of most of the Theoremes therein expressed, and withall detects a fundamental error of *Galen*, whose *tenet* distinguisheth the influent heat essentially from the innate heat, whereas the former is nothing else but the flame of the latter increased by spirits lately advened and united to it by the last concocted nutriment. But of this more expressly in my *Archelogia laurica*. Notwithstanding I shall continue the history of Accretion in each part: Through the fore-mentioned expansion, rarefaction, and intumescence, the circumduced pellicles, being two in number, differing from one another only in crassitude, are gradually distended, untill at last all the parts being perfectly formed by the mechanick or plastick spirits in the manner before said, break their Membranes first (naturally) at the top next towards the Surface of the Earth, but counter-naturally at the sides.

The cause of this first eruption through the top depends upon the swifter and more forcible turgency of the light Elements tending upwards; besides, upon the upper parts being more rarefied and attenuated through their greater nearness to the influential heat.

The Root erupts soon after its having pierced through the membranes by means of its weight strengthened by course heat, groweth downwards, and spreads into branches, like the upper parts grow upwards spreading likewise into boughs: These are more rare and thin, as consisting of a thinner and rarer flame, and of a thin (yet solid) sperm, which according to the capacity of the same principles now mentioned do form themselves into boughs and leaves, attracting every day nourishment proportionable to what was dissipated. The Root doth in the same manner accrease by attracting weighty nutriment, being impregnated with a dense heat, and therefore can clime no higher; but as for that which is more rare and thin, it ascends higher or lower according to its proportion of tenuity and rarity.

The

The similar parts are accreased out of the more humorous parts of the attracted nutriment; the solid ones out of the grosser parts of it. The barke is accreased out of the grossest reliques of the Aliment; the fibres out of the grosser; the fleshy parts out of a mean substance, between gross and subtil, solid and liquid; the medullar ones out of the more unctious and rare parts; the boughs out of nutriment somewhat more subtil and rare than that of the middle body or trunk.

The redounding parts draw matter for their accretion from the more waterish parts of the plant abounding in her, which parts do contain a remnant of all the similar & dissimilar parts of the whole.

That these are abounding parts, their appearance only at such times when a plant is not alone filled but over-filled with nutriment doth testifie, which usually hapneth in the Spring, Summer, and Autumn. Leaves do germinate, when the said matter is less concocted however supplied in great abundance; whence it is, that they make choice of a green colour, and are expanded into Latitude. Flowers appear, when the said matter is somewhat more concocted, and are only protruded out of the better and subtiler part of it, whence many of them become odoniferous. Fruits are engendred out of the same subtil matter being yet more concocted, whence it is that most do take their beginning from a subtilty for to acquire a crassitude, (according to this trite one *substantia coctione evadunt crassiores*) whose more terrestrial part falling through its weight to the center concreaseth into a kernel or stone, whereupon the other parts do fasten as upon a foundation, increasing dayly by apposition of new matter.

The recremental parts I call so, because they are generated out of the greater part of such matters as ought to be excerned, but containing some alimentary ones are retained and agglutinated, whence they chance to be somewhat like and dislike to the other parts.

Plants are variously divided, 1. Into three species, viz. an herb, which is a Plant, some consisting of a root only; others of a root stalk, and leaves, whereof some comprehend (*Fruges & Olera*) Corn and Potherbs.

2. A shrub is a plant fastned to the ground by a root, and spreading into many boughs without a trunk.

3. A tree is a Plant obtaining a root, trunk and boughs.

In respect to their place of conception some are said to be terrestrial, others aqueous; some wild, others Garden Plants: According to their bigness, some great, others small. And in regard of their fructification, some fruitfull, others barren; or to their germination, some to bud forth sooner, others latter. For instance the Turnip, Basil, and Lettuce, shew themselves within three or four daies, others in five or six daies, as a Gourd, the Beete, &c. some in eight daies, as the Orach; Some in ten, as the Cabbage; others in twenty daies, as Leeks; Parsly in forty or fifty; Piony and Mandrake scarce less than within a year: Many other differences taken from their Colour, Figure, &c. I do wittingly omit.

The *propagation* of a Plant is, whereby it doth generate its like *in specie* through semination. This is the last function, that a Plant exerciseth; for it must be nourisht and accreased to a just magnitude before it can attain to this most perfect and compleat action.

Semination is the means whereby it performeth the same, and is a Plants bringing forth of seed; this name in the English otherwise soundeth a seeding. Seed is the abridgment of an intire Plant, whereby it doth multiply it self into many of the same kind.

But the great question will be, whence it is, that a Plant obtaineth this power, and what Seed properly is.

Here you are to observe, that Seed is twofold.

1. It is that, which is casually (as it may seem to us) constituted within the Earth through the concurrence of the Elements into one body being particularly so tempered, as to be disposed to germinate into a Plant. Of this I have spoken sufficiently before, where it appears that it precedes the constitution of a Plant, whereas the other whereof I am to treat at present, doth consecute a preceding Plant, and is generated by it.

Seed in this second acception is a dissimilar substance, consisting of the rudiments of all the parts of a Plant, that are to liken the propagatrix (or from which it was propagated) *in specie*.

The manner of semination is thus: A Plant having already disburdened it self of its fulness or abundance of nutriment by casting forth Leaves, Flowers, and Fruits, there is still a remnant of abundance of the best nutriment, which a Plant being now exalted

to its vigour in its operations through the preceding Spring and Summers heat doth concoct to the highest degree, and a just consistency, wherein the spirits are united with the solid parts so as it may be requisite for them to become Seed, each part of the propagating Plant discharging its abundance that waies, where the passage is most free, which is towards the top, whereunto the external heat, being attractive, seems also to contribute: downwards it cannot tend, because the passage is stop'd by nutriment, that is impelled upwards from the root. The said abundancies meeting in one cavity or passage towards the top of the stalk of an herb or branch of a tree unite into one, where the contiguous parts consisting most of a vital heat possess themselves of the center, impelling the continuous ones to the Circumference, which tie them all close into one, and are as it were a firmament about them, their extreame parts concreasing into pellicles. This union is confuse, that is, each dissimilar part is not mixed with the other, but only glued and tyed, (because their arct composition * doth impede it,) in a confuse manner, that is no distinct shape, figure, form, or exact order: These they acquire within their spermatick cavities, but after conception in a womb, where their body being soon loosened, then each dissimilar part through its degree and proportion of levity and gravity falls naturally into its own ranke and order.

* Of each dissimilar part in particular.

Besides this natural manner of propagation, there is another artificial one practised among Gardeners, by planting a sprig of a tree into the ground, or ingrafting of it into another tree between the wood and the bark, whereof the former groweth up to a tree, the latter spreads it self into boughs and branches. The same is also effected by thrusting some roots into the earth, as a Liquorish or Lilly root: Or by planting some kind of leaves into the ground, as of Indian figs or Opuntia. This hapneth by reason those fore-mentioned Plants are indued with very extensibile spermatick parts and copious innate spirits, each bough being sufficient to accrease to a tree, were it near enough to the earth to attract proportionable nutriment, but being remote must be satisfied and increase according to the quantity of access of aliment. 2. Each sprig of most trees; as also the foresaid roots and leaves containing the rudiments of all the dissimilar parts, which the whole doth, doth accrease into other parts, *viz.* roots, trunk and branches by the qualification of the aliment: The courser accreasing about the lower part into a root,

the mean into a trunk, the finer into branches. Nevertheless this is observable, that trees propagated out of sprigs are nothing near so fruitful, or so long lived as those from the Seed.

After a Plant hath done her endeavour in producing fruits and seeds, she decreaseth, some yielding yearly, others monthly and daily of their magnitude, vigour, and rictorous complexion, shrinking by degrees by reason of the waisting of the spermatick matter and innate spirits, untill at last they naturally die through extream driness and coldness, or rather through an entire dissolution of their temperament. Counternaturally a plant is further exposed to many diseases, and a violent death distinguisht into two sorts, the one hapning *κτ' ὀβρον*, whereby a plant is frozen to death; the other *κτ' ὑπερβρον*, through an immoderate extrinsick heat, extracting, dissipating, and consuming the innate spirits of a Plant. Either of these may befall a part or a branch alone of a tree, and then a part of it is alone said to be dead.

CHAP. V.

Of the particular differences of Plants.

1. The differences of Roots and their vertues.
2. The differences of Flowers.
3. The differences of Leaves.
4. The three cordial Vegetables.
5. The three Cephalick Vegetables.
6. The three Heparick Vegetables.
7. The three Splenick Vegetables.
8. The three Pulmonick Vegetables.
9. The three Stomachick Vegetables.
10. The three Lithontripsick Vegetables.
11. The three Uterin Vegetables.
12. The three Arthritic Vegetables.
13. The specifics for the parts destined for the continuation of the species.
14. The description of some rare Plants.

1. **R**oots differ in Figure, some being long and round, others round like a Ball, some straight, bowed, flat, others like to some

some fruit or other ; so a Parsly root resembles a Pear, the root of Kingspeare an Acorn, the root of Anemone and of Cypress an Olive ; besides infinite other varieties of Figure.

2. In number ; Grass, Asaraback, white Masterwort, Hemionitis, insift upon many roots ; Aloes upon one, the Mandrake, Sword-flagg, most of the kinds of Satyrion upon two, Nightshade upon three or four ; Vervain, Mallow, and grass of *Paruassus* upon five or six ; the greater Celandine upon one, divided below into many.

3. In colour, some being red, purple, white, black, yellow ; others of various colours. 4. In inconsistency, some choosing a hard root, as the greater Centaury, China, &c. Others a soft one, as Alexander ; some again are hollow in their root, as Pistolochia ; others being unequal or knobby, as Polypody, sweet garden flag, Flowerdeluce.

5. In taste, some are sweet, as Liquorish ; others bitter, as Birthwort : Others bitter at ones first tasting of it, and afterwards changing into a sweet taste, as the root of Cachou.

6. Some are big, as the roots of a Caper shrub, Mandrake, wild Cowcumber, Briony ; others small, as the roots of Grass, Asarabacca, &c.

Stalks do likewise alter : 1. In figure ; some being round, others consisting of two angles, as *Daffodile* ; some being Triangular, as Cypress ; Quadrangular, as Horehound ; Pentagonal, Hexagonal, as Trifole, purple Willow weed ; some are nodous, as some Indian Canes, Soap-wort, Carnations, &c. others are hollow as Canes, and Elder.

2. In number ; so *Oreoselinum*, and most Trees, usually emit but one. *Alica* a kind of wheat gourts sprouts out three or four stalks. Rie six or seven from one root. Deadly Nightshade ten or twelve.

3. In colours ; some are red, black, white, green, &c. others speckr, some are glabrous, others clad with a wool, as *Rose Campion*.

II. Flowers differ in their Leaves, some being round, as the flowers of Woodbine ; others bent in, as those of a *Flowerdeluce* ; the leaves of the flowers of smooth Bindweed are set round in a circle, resembling a clock ; The flowers of Lions mouth are like to a gaping Lions mouth ; some resemble a Cone, a Navil, a Ball, as Bowlwort flowers. The flowers of Foxglove are like to a womans

N n n n a

Thimble ;

Thimble; Many flowers resemble a Butter-fly, &c. Some grow from the stalk, root, or top; some grow single, and others double, four, five, or six, or a heap together, as Wall-flowers: other differences are commonly known, as their colour, consistency, smoothness, &c.

The differences of Seeds and Fruits are as many as of Roots, Stalks and Flowers, which since you may easily gather thence, I shall save my labour of rehearsing them.

III. Leaves differ, 1. In colour: Bramble leaves and those of some kinds of Blites are of various colours in their leaves: The leaves of Horehound, Campion, and Mullein are gray with a kind of wool at top of them. The leaves of *Lamium verum* have a long spot in the middle of them: The leaves of *Othonna* and *St. Johns-wort* are bored through with holes like to a sieve: Some are hard, as some kind of Grass and Ditch Dock; others harsh, as wild Cow-cumber leaves; others tender, as Celandine; others feel fat, as Bears-breech, Purflane; some are glibe and smooth, as Mandrake and Bears-breech; others curling, as some sorts of Cabbage.

2. In shape; some being round and long, as some sorts of Houfleeke; Venus Navel, Monywort, Trefoile, &c. are round; Nettles, Coltsfoot, &c. are angulous or dented about their extremities. The leaves of Venus Navel and of wild Teasel are hollow. Grass leaves, Flower-de-luce, and Sword-flig are pointed: Leaves vary much in their incisures, some being deeper, as those of Radish leaves, Licebane, Bucks-horn, Plantain, Red Poppy, Vervain; others more shallow, as those of Nettles. *Hercules wound-wort* is marked only with five incisures; others have few or none.

3. In number: The Unifoil is contented with one leaf, the Satyrion with two, the Tulip with three; *Herba Paris* and *Tetraphylon* with four: Other Plants are full of leaves, as Thyme, Asparagus; others are bare. Besides, some come forth after the flower, as the Peach-leaves. Others come out before the flowers: Some come forth soon, others late; some in one month, others in another, viz. Asarabacca, Asparagus, Chast tree leaves, ground-Ivy, Violet leaves, Willow leaves, in the month of *March*: Common Avena, Barbery leaves, Colts-foot, Lettuce, Plantaine, Scurvy-grass, Sorrel, petty Sorrel, Saxifrage, yellow Violets, in *April*. Agrimony, Bears-breech, Borrage, Bugloss, Betony, Celandine, Fumitory, German-der, Marigold, Purflane, Rosemary, Self-heal, Wormwood, Southernwood, in *May*. Camomile, Succory, Endive, Fennil, Marsh-

Marsh-Mallow, Melilot, Mercury, Piony, Rue, Sage, water-Lilly, water-Germander, in *June*. Bay leaves, Lavender, Lovage, Mallow, Mugwort, Marjerom, Garden-Cresses, Strawberry leaves, Savin, Thime, Tanfie, Vervain, are in their prime in *July*. Burnet, Baume, Card. Bened. Elder, Eyebright, Mullein, Oake leaves, in *August*. Angelica, Butter-burre, Cyprus, Cumfry, Cinquefoile, Ellicampane, Elebor, Polypody, Solomons seal, Valerian, in *September*.

Because we will not be deficient in what may appertain to Natural Philosophy, we shall insert a short description of the choicest Herbs, appropriating three to every principal, and less principal part of the body.

IV. The three Cordials are,

1. Baume is cordial beyond all Vegetables, excelling in faintnesses and extream weakneses, particularly in fainting fits proceeding from an uterin suffocation, and is a singular herb in most uterin distempers. In Melancholy, Convulsion fits, and an Apoplexy it is admirable.

2. As the foregoing Vegetable is so much commended in cold distempers of the heart, so is a Pome Citron in hot diseases, cherishing the heart beyond expression when beset with fiery smokes in an ardent Feaver, resisting putrefaction, defending the heart from all malignancy and poyson.

3. Goats Rue is a most famous Cordial, Alexipharmacal resisting and expelling all poysons, Pestilential Malignancies, and of an unparallel vertue in spotted Feavers, Small-Pox, Measels, Convulsion fits of Children, and the Worms.

V. The three Cephalicks are,

1. Male Piony all Ages have observed to be stupendious in curing distempers of the Brain, particularly the Falling-sickness in men women and children, chronical head-aches, melancholy of the brain, frights of Children, palsie, Night-mare: It is of a moderate sharp heat and driness, and somewhat adstringive.

2. Garden Rue hath been in great esteem among the greatest of Physicians for its admirable effects upon Epileptick, Apoplectick and Paralytick brains; and for curing inveterate head-aches it is incomparable; It is very hot and dry, sharp, attenuating and discutient, and flourisheth in *June*.

3. Sage we may admire for its rare properties upon all moist brains, in curing Catarrhes, Palsies, a lost Memory, dulness of the Under-

Understanding, and quickning all the senses to admiration, being in its prime in *July*.

VI. The Hepaticks are,

1. Agrimony is the strength, life, and preservation of the Liver, removes its obstructions, engenders the purest blood, cures all Dropsies, and any kind of bad habit of body; it is moderately hot and dry, subtil, aperitive, detergent and subadstringent.

2. Succory Nature particularly created for the Liver, and induceth it with the greatest virtue of preserving and comforting its sanguification, opening obstructions, and of curing all its distempers. It is moderately cool and dry, detergent, and attenuating.

3. Fumitory never failes of removing all obstructions of the Liver, purifying the blood from its dross and melancholy, curing the Itch, Scurvy, and yellow Jaundise, and comforting the Liver through a specifick property; it is gently hot and dry, detergent, and attenuating.

VII. The Spleneticks are,

1. Polypody is the great specifick against all splenetick distempers, as obstructions, scurvies, black Jaundise, Hypochondriac Melancholy. It is hot and dry, mundifying and gently purgative.

2. The Bark of the Caper shrub being dry and hot, bitter, attenuating and somewhat adstringent, doth thence exert its most noble faculties against all splenetick distempers, particularly against Hypochondriack melancholy, the Scurvy, and all obstructions of the Spleen.

3. Spleen-wort is dignified with that name from the certainty and excellency of its effects in all the forementioned diseases of the Spleen. It is moderately hot and dry, aperitive and detergent, and is in its prime in *September*.

VIII. The Pulmonicks are,

1. Coltsfoot is a most singular simple in helping expectoration, thence curing all Coughs, Ptisicks, and all other difficulties of breathing. It is gently hot and dry, and somewhat sharp.

2. Ellicampane is very effectual in all difficulties of Respiration, Coughs, and comforts the Lungs. It is very hot and dry, cutting, sharp, and detergent.

3. Red Poppy is the sole cold Pulmonick, whose virtue is more then admirable in a Pleurisie.

IX The Stomachicks are,

1. Roman

1. Roman Wormwood was never doubted to cure weakneses of the stom ch, and to cleanse it from all its slimy and tartarous dregs. It is very hot and dry, bitter and adstringent.

2. Zeadoary is very hot, dry and adstringent, thence proves a most excellent specifick to strengthen the stomach.

3. Cinamon is commended beyond all Spices for a most excellent comforter of the stomach.

X. The Nephriticks are,

1. Saxifrage : The great benefit which Nephritick Patients have received hence occasioned the imposition of its name sounding an undoubted breaker of the Stone, being the quickest and most forcible diuretick of all Vegetables, whence it doth much conduce in all obstructions of the Kidneys, and stoppages of urine. It is very hot, dry, and attenuating ; and is an *April* herb.

2. Winter-Cherry berries are of most subtil parts in a moderate cold and dry temperament, and are purposely selected by Nature for those Nephritick Patients that are of a hot temperament, breaking the stone in the Kidneys most powerfully, and expelling Urine with no less force. They are most effectual in *August*.

3. Marsh-Mallow is an herb of a third sort of Nephrocatharticks, being moderately moist, hot, emollient, discutient, mitigating all pains of the Kidneys, and abating the sharpness of Urine : Even this Vegetable is in nothing inferiour to either of the foregoing, effecting the same effects through its dissolving moisture.

XI. The Uterin specificks are,

1. *Dictamnus Creius*, or Dittany of *Candia* is a most excellent Uterin Vegetable, comforting the complexion of the Matrix, reserating its greatest obstructions, expelling all excrementitious humours through facilitating the *menstrua*, producing withal a swift and easie Labour in Women, and is admirable in forcing a dead Child out of the *Matrix* : Besides, it is much conducing in all Hysterick suffocations, being very hot and dry, and penetrating.

2. Mugwort is hot and dry, aperitive, and discutient ; cleanseth the Matrix, and excels in the same vertue that Dittany doth.

3. Featherfew is very hot, dry, penetrating, and aperitive, yielding to neither of the precedents in vertues : It is most efficacious in *June*.

XII. The Arthriticks are,

1. *Sassafras*. If there be ever a Neuritick under the Canopy of the

the Heavens it is the Bark of the root of this tree, strengthening weak joynts, and relaxt sinews, drying up Catarrhs beyond all belief, and in the Gout it is miraculous, being hot, dry, aromatick, sudorifick, discutient, and aperitive.

2. Ground Pine is a certain and most efficacious Neuritick, and admirable in curing the Gout: It is very dry and hot, aperitive and cutting.

3. Germander although the last of the three is not therefore inferior to the first, but agreeing in the same vertues and qualities with it. Both these latter are in their greatest strength in *July*.

XIII. Lastly, to please all parties I shall beyond my purpose recommend three of the most approved Vegetables to help the languor of the parts destined for the preservation of the species.

The first is Dog Stones, being of a moist and hot temperament, comforting those parts to admiration, and rendring either Sex very lusty.

The second is Green Ginger, which is only fit to be eaten by those that are of a frigid temperature, whom it will soon put into a contrary passion.

The third is Rocket, an herb whose seed is potent enough to change the coldest temperament into a Satyr's lasciviousness. If now your mind tends to the contempt of this beastiality, then certainly spirit or sugar of Saturn will put you into another kind of devotion, and better sure with your temper.

Here I have propos'd to you a select number of Simples, sufficient to cure most internal diseases, that are incident to the body of man, whereby you may be guided out of those dangers accompanying the making choice of them out of that infinite number of Vegetables, whose vertues you must be forced to take upon other mens words, oft disagreeing with the expected effects: Wherefore know that each of these (excepting the latter four,) I have experienced many and many times upon several bodies, not only so, but have had them formerly in my travels recommended to me by the eminentest of Physitians abroad as the greatest and most certain vegetable specifics.

XIV. For a Corollary take the description of some rare Plants.

The *Parisatico*, alias *Singady*, or the mournful tree groweth only at *Goa*, *Malacca*, and some few other places; in shape it resembles a Plum-

a Plum-tree; it doth within half an hour after the Suns going down shew it self white all over with most pleasant and fragrant flowers, Like to those of an Orange tree, whereas at the Suns going down there was not one to be seen upon it. These flowers stick fast all night untill the rising of the Sun, and then they do all fall off, but towards the Evening others are spread forth again, and so this continues all the year long.

Arvore de Rays, or the root tree, is an East-Indian shrub growing up to a certain height, and spreading it self into branches, from whose top roots do grow down into the earth, whence they spring out again into other shrubs of the former height, which again at their top emit other roots downwards in a manner, that in some space of time this shrub spreading it self near half an English mile round becomes an intricate Forrest formed (as it were) out of one continuous Tree.

The herb *Sentida*, or sensitive Plant may be a pattern of chastity to all; the which if you do only touch or cast a little sand upon it, its leaves do immediately retract and shut themselves up, and do open no sooner again, than your finger or what you have cast upon them is withdrawn.

The she Palm-trees it is observed do not yield any fruit unless planted near to a male Palm tree, to which they seem all to incline having their boughs more extended towards it at that side than at any other, whence the *Æthiopians* do usually plant them so, that the wind may carry steams from the Male to the Female; but in case the male tree be taken away from between the others, they become barren and give over bringing forth fruit. The fruits of the Indian Palm tree are called *Coquos*, being filled within with water; the wight within is very tender and soft, and tastes like to an Artichoke, but after a longer maturation groweth harder, and eats like a Haselnut. The water, which each of them contains in the measure of a pint or two, is very clear and pleasant to drink. This tree contains materials for a whole Ship: Its wood being light and spongy they cut into planck, which they tie together with cords that are drawn off from the said *Coquos*; The sails are made out of the leaves, which the Indians call *Olas*.

It is reported, that there is a tree in *Java Major*, whose innermost marrow is Iron, being very thin, and running through the whole length of the tree: Its fruit is likewise as hard as Iron. In

the Island of *Tylos* there are Cotten trees, whose gourds being of the bigness of Quinces are found to be full of Cotten when they break through over-ripeness. There is a tree in the Island *Cimbubon*, whose twigs being fallen down to the ground do move themselves forwards as if they crept, having two small legs of each side; and if they be toucht they creep back.

CHAP. VI.

Of Water in order to her Commerce with the other Elements.

1. *The Etymology of Water. That Water naturally is hard and consistent, and not fluid.*
2. *The Division of Water.*
3. *What a Lake is. The strange vertues of some Lakes.*
4. *What a Fountain is. The wonderful properties of some Fountains.*
5. *Of Physical Wells.* 6. *Of Baths.*
7. *Of Rivers and their rare properties.*
8. *Of the chief Straits of the Sea.*

1. **W**ATER seems to be derived from washing, from its use, because people make use of it to wash their foul things with. So *laver* in French from *Laver* to wash, and *Wasser* in High Dutch from *Waschen* denoting the same. *Aqua* in the Latine was imposed upon it for to express its excellency, and its absolute necessity for the preservation of humane life. *Aqua dicitur quasi a qua vivamus, nutriamur, & a qua nobis plurima supersint commoda: Pisces nobis alit, navium vehiculo inservit, quibus non pauca nobis afferuntur necessaria, ignisque est pandomitrix, terram fecundans, aeremque spirabilem nobis reddens.*

Formerly we have discoursed of Water and its form absolutely considered, now we are to apply it as it relates to the other Elements and is the proper cause of her Commerce with them.

Water although appearing fluid, yet naturally, that is absolutely conceived by it self is void of all fluor, but partakes of the greatest weight,

weight, hardness, crassitude, smoothness, and consistency that is imaginable. I prove it; Water the more it is remote from the intense heat of the Sun the more heavy, thick, hard, smooth, and consistent it is: Have you not Mountains of Ice of great weight, thickness, &c. in Greenland in the Summer, much more in the Winter, yet more directly under the Poles, and most of all if apprehended absolute by it self, and deprived from extrinsick air and fire, when we cannot but judge it to be of the greatest weight, thickness, and consistency that is apprehensible? The Scripture seems to attest the same, *Job 38. And the waters are hid as with a stone, and the face of the deep is frozen*; By the deep here is meant the Chaos, ergo the waters were naturally at their first creation thick and hard. Lastly, As there are two fluid Elements, viz. fire and air: So it is also necessary, that they should be balanced and met with two opposite consistent ones, namely, Earth and Water. The first being contiguous and hard responds to fire; the other being continuous and hard responds to air being continuous and soft. Whence we may safely conclude, that it is the advent of the fire together with the air that renders the water thus thin and fluid, as we see it is.

II. How Water first gained such a body together as the Sea is, our exposition of the worlds creation will advise you. The Sea is the greatest collection of water; by the Latinists it is called *Mare*, from *Meare* to go or to flow, and not from *amarum*, or the word *Marath* among the Chaldeans signifying bitter, as some have thought; so it is likewise called *Oceanus*, the Ocean from *Ocior amnis*, a swift current. It procures various distinctions from its beating against several shores; from those of the East and West *India* it is surnamed the East and West Indian Ocean; of the Mount *Atlas* the Atlantick Ocean; from those of *Sarmatia*, the Sarmatick Ocean; near *Madagascar* the rough Sea, from the quicksands that are frequently thereabout; of *Spain* and *Brittain*, the Spanish and Brittainish Ocean, &c. And from the Place whence it doth flow it is called the East, West, South, or North Ocean. The same spreads it self into many particular Seas, or great Bayes, whereof these are the more principal.

1. The Mediterranean Sea, so named, because it flows through the middle of two great parts of the Earth, viz. between a great part of *Europe*, *Africa*, and *Asia*: Or more particularly between *Spain*, *France*, *Italy*, *Dalmatia*, *Greece*, and *Natolia* of the one side,

* From the
Balearic
Islands, to
wit, Major-
ca & Mi-
norca.

and *Egypt* and *Barbary* of the other. Where it toucheth the Spanish coast it is called the *Iberick* sea; and more forward the French *Balearick**; *Ligustick* near *Genoa*, *Tyrrhenian* or *Tuscan*; about *Sicily* *Sardinian*, *Sicilian*, *Adriatick*, *Cretick*, *Libyan*, *Phoenicean*, *Cyprian*, *Syriack* sea, &c. its mouth is called the *Straits*.

2. *Pontus Euxinus*, the *Euxian* sea; otherwise named the black sea or *Mare Majus*, whose mouth is called the *Hellespont* from its narrowness, its throat *Propontis* and the *Thracian Bosphor*, so called from *bos* an Oxe, as if an Oxe were too big to pass through that narrowness.

3. The *Arabian* and *Persian* sea.

4. The *Gangeric* sea, so named from the river *Ganges*, which is disburdened into it.

5. The *Red* sea, deriving that name not from the colour of the sea, but of the red sand, over which it floweth.

* From *Balticus* a Belt,
because it
environeth
Scoten like
a Belt.

The *Baltick** Sea, alias the *Sinus Coddanus*, or *Suevick* Sea, from the *Suevi*, a Nation that formerly inhabited those coasts; at the mouth it is called the Sound flowing 150 leagues far between *Denmark*, *Finland*, *Sueden*, *Prussia*, *Liefland*, *Pomerania*, and *Saxony*.

The *pacifick* sea is so called from the gentleness of the waves; or the South sea, because it lyeth to the Southward of the Line, limited by the coasts of *Asia*, *America*, and *terra Australis*, or the Country of *Megallan*.

III. A Lake is a great and perennial collection of water surrounded by the Earth, whereby it is cut off from the Sea; It is distinguished from a Pool, in that the one is perennial, the other is apt to be dried up sometime by the heat of the Sun and driness of the earth, and to be filled up again with rain: Some of these being famous for their extent, others for their admirable qualities I shall willingly insert.

1. The greatest Lake in the Universe is the *Caspian* sea in *Asia*, otherwise called the great sea, the *Albanian*, *Hircanian*, *Pontick*, *Tartarian* Sea, the Sea of *Sala*, *Bachu*, *Abachu*, *Terbestan*, or *Giorgian*. It diffuseth it self into three Bayes or Gulphs, viz. near the Mouth into the *Hircanian*, on the right side into the *Caspian*, and on the left side into the *Scythick* Gulph. It bears the name of a Sea very improperly, since it is incompassed by the Earth: Nevertheless it is saltish and full of fish.

2. The Lake *Asphaltites* in *Judea*, (otherwise called the dead Sea)

Sea from its immobility, because as *Corn. Tacit.* relates that scarce any wind be it never so violent is strong enough to lift it up into Waves) is noted for sustaining weighty bodies (especially if anointed with Alumewater) that are cast into it, in a manner that a man his hands and legs being tyed and cast into it shall swim; it breeds no fish nor any other living creatures. The Lake of the lesser *Armenia*, and the Lake *Aposcidamus* in *Africa*, and of *Sicily* are almost of the same strength. On the contrary the Lake *Avernum* in *Campania* and that of *Ethiopia* are unable to sustain the weight of a leaf fallen into them from a tree; and according to *Pliny*, there is no fowl that flies over them, but falleth dead into them. There is a Lake near *Lerna*, and another in *Portugal*, which are so attractive and depressing, that they do immediately draw and press down to the bottom whatever is cast into them, in such a manner, that a man having thrust his hand into either, must use force to draw it out again. *Pomponius Mela*, and *Solinus* make mention of a Lake in *Ethiopia*, which to the eye appearing crystalline, and sweet to the palate, doth so besmear those that bath in it, as if they had been duckt into a bath of oyl.

In the west of the Isle of *Iseland* travellers have discovered a great Lake, fumous & very cold, in a short space changing whatever is cast into it into a stonish or rockish body: a stick being thrust right up into the bottom, that part which is under water is in two daies changed into an Iron substance, the other above remaining what it was. *Hect. Boeth.* writes of another in *Ireland*, which after some months renders that part of a stick that is thrust into the ground Iron; the other part that is under water flinty, the upper part above the water continuing wood.

In *Thrace* it is said there is a Lake, whose water proves mortal to any that do drink of it, or do bath therein. Many of the *Troglodites* have forfeited their reason for venturing to taste of the water of a pernicious Lake in that Country. The Lake *Clitorius* effects sobriety in men, and excites them to a hatred against Wine and Drunkenness. The Lake *Gerasa* in the Country of the *Gadarens*, whereinto the Herd of Swine, animated with those dispossessed devils, (of whom we read in *Luk. 8. 33.*) violently ran down, is at present so venomous, that it causes the hair and nails of all those to come off, that have at any time drank of it.

The Lake *Laumond* in *Scotland*, imbracing thirty Islands breeds fish

fish without finnes, and is cast sometimes into a most raging tempest, although there be little or no wind stirring: One of those Islands is said to fluctuate up and down in her.

The Lakes of *Chirchen* in *China* is said to change Iron into Copper.

Scotland is noted for a Lake, whereof the one half yieldeth to be hardened by the frost, the other maintaining her fluidity the whole Winter. So likewise in *Norway*, although *Saturn* is felt to be very furious there, yet many Lakes lye open all the Winter. The like is observable in a Lake near *New Castle*, which in some part refuseth concretion, although in the coldest weather.

There is a Lake near *Nidrossa*, whose waters atop are extreemly cold, but the mud near the bottom is constantly boyling hot, insomuch that if you tye an Egg to a string and let it sink down to the bottom, you may soon draw it up ready boyled.

Not far from *Jensu*, a City in *China*, is a Lake, which is very cold in the Summer, and scalding hot in the Winter: The same is said of the Lake *Jen* near *Chinchen* in the same Country.

The waters of the Lake *Anien*, at first feel extreem cold, but after a little while they begin to feel warm; they also generate stones out of any matter received from without.

The Lake of *Vadimon* shews it self sometimes suddenly very turbulent, without giving any manifest token of the cause of it. The same is said of the Lake of *Geneve* or *Lausanne*.

Italy is dignified with one of the most famous Lakes in the world called *Benaco*; its plaissance is supplied by a sight of Olive trees, growing upon its borders, and beautified about the sides with gardens planted with Citron and Pomgranate trees, fertilized with rare fish, having its water so bright and clear, that you may plainly see the bottom through it, except in the middle, where it is almost not to be fathomed; but notwithstanding so fair a complexion in good weather, yet appears much more humourous in foul, in such a manner that it doth then cast it self into raging high waves, whereby it proves no less dangerous and dreadful than a tempestuous sea.

The Lake *Larius*, by the *Herrusces* styled the Prince of Lakes, is much swelled in its belly through the swallowing up of the River *Abda*, alias *Abdua*, tumbling down from the Rhetian Alps through the Valley *Voltilena*, Boaring with a swift stream through the said standing water, which gives it passage without the least commotion

tion of its body, neither permits it self to be mingled with those rapid and most limpid streams: The said River persisting in its Velocity breaks out again near *Lenk*, a Village. In like manner doth the River *Rhene* stream through the Lake *Acronius*, and the River *Danow* through part of the *Surian* Sea.

Hispaniola is watered with a great Lake named by the Inhabitants *Hamegabau*, into which many great Rivers are disburdened, and to the admiration of many is nothing engrossed, although visibly venting no part of what it hath imbibed: The same is observed of the *Caspian* sea, receiving the copious evacuations of the Rivers *Volga*, *Janick*, *Abiamu*, *Chesel*, and many others.

Lucerna a Town in *Switzerland* is situated near to a Lake, whereinto a stone or piece of wood being cast doth set it into so vehement a commotion that it fluctuates upwards in roaring waves, and surmounting its borders happens sometimes to cause an inundation of the next adjacent fields; wherefore for the prevention of such inconveniencies it is decreed by the Magistrate, that none shall offer to cast any thing into it upon a severe penalty. The Inhabitants impute the foresaid exultation to the pernicious infection, which the Lake received from the pestilent Carcass of that hellish Judge *Pontius Pilate*, who after his banishment was thought to have drowned himself therein, whence it is, that they vulgarly call it *Pilate's Pool*.

There is a Lake not unlike to this upon the Mount *Tidala* near *Chaoking* in *China*, whereinto if one throws a stone or any other heavy thing, he will immediately hear a roaring noise like thunder, and soon after the sky about it grows gloomy and casts down rain.

In *Carniola* near the chief City *Laubach* every year about the Autumn there appears a Pool between some mountains, about a league and half in compass, and abounding with fish, none apprehending whence this quantity of moisture should derive, and towards the Spring it begins to dry up, after which the ground is copiously fertilized, and is haunted with a number of Deer.

IV. A Fountain or Spring is a perennial eruption of water out of the Earth.

The differences of these is no less various, than of Lakes; to wit, in quantity, quality, motion, and situation. Furthermore some are artificial, others natural. We shall only instance the admirable properties of some of the latter.

Aristotle

Aristotle writes of a Fountain in *Thrace* (whereunto another in *Arcadia* named *Syrx*, as also one in *Sarmatia*, and that of *Armenia*, *Lydia*, and *Sicilia*, are like in vertue) which casteth the drinkers of it into a mortal Syncope; breeding fish working the same effect upon those that eat them.

The waters of the Founts of *Valentia* in *Spain*, *Wolchenstein*, *Trecha*, the Kingdom of *Crobus* upon the *Alpes*, *Berosus*, and of *Manglo* in *China*, are all deleterious, corrosive, and extreemly venomous.

Bœtia spouts out two springs, whereof the one called *Leche* effects forgetfulness, the other cures it.

The water of the Fountain in the Island *Cea*, (as *Pliny* relates,) being drank dulleth a mans understanding and makes him sottish.

The Fountain of *Susa* in *Persia* loosens the teeth, and causeth them to fall out; *Pliny* speaks also of another in *Germany* on the other side of the *Rhene* effecting the same.

A draught of the water of *Lyncistis* filleth a mans brain and makes him drunk.

The Fountain of *Arania*, a part of *Arcadia*, makes one loath Wine. *Isidorus* and *Solinus* write of two Fountains, whereof the one procures fruitfulness in women, the other barrenness.

The *Garamans* make mention of a Fountain among them, called the fountain of the *Sun*, whose extreem coldness in the day renders it impotable, and in the night is so excessive hot, that it proves scalding. *Aristotle* relates of the Fountain *Elusine*, which naturally being quiet and clear, is affected with the noise of any musical Instrument, in a manner, that at its sound it is apt to fieeth and run over as if it were for joy.

Baptista Fulgosius affirms to have seen a Fountain, which appears very clear and still to one walking about it, and looking therein without speaking; but if speaking, although but a few words, it is immediately put into a commotion and fieething, appearing very turbulēt. The same Author makes mention of another in *France*, which being for the most part of a very cold nature doth nevertheless not fail of casting flaming fire from it. There is a fountain in *Illyrium*, that like fire burns into ashes whatever is cast into it.

Epyrus and *Cyrenaica* are noted for Fountains, which in the morning and evening feel warm, at noon hot, and in the night scalding. The same is said of the Fountain *Animonius*.

For

For Springs to be cool in the summer, and warm in the Winter is not extraordinary. In *Arcadia* springs a certain fountain out of the mountains, whose water is so extreame and piercing cold, that no golden or silver vessel is capable to hold it, but is forced into pieces by it; nevertheless it suffers it self to be contained in a Mules Hoof.

Not far off from the *Danow* there is a Fountain surnamed the Fountain of the *Holy Cross*, which sometimes casts out abundant streams of perfect blood very useful for the curing of sundry diseases. A fountain in the Island *Tenedo* doth during the Summer alwaies overflow from three in the night to six in the morning.

There are three Fountains in *Cantabria*, that sink dry in twelve hours, and fill up again in the same space of time.

The fountain *Cyane* among the *Syracusans*, as also another in *Hungaria* increase and decrease with the course of the Moon. The same is said of the fountain of *Hucune* in *China*. The fountain of *Jupiter* in *Dodan* is said to sink and rise thrice of a day. Another in *Epirus* doth begin to ebb in the morning, is dry at noon, fills up again towards the Evening, and at midnight is risen to that fullness that it runs over.

There is a fountain near *Weenen* generating stones out of any thing that is cast into it. Many waters, as they drop from the hills, concreate into stones as soon as they arrive to their rest; and these drops being multiplied concreate at last into pillars of stone.

The Fountains of *Herbogia*, *Veronium* in *France*, *Zepusium* in *Dacia* do all breed great abundance of stones out of and within themselves. *Fulgosius* speaks of another in *England* of the same nature.

The water of *Sibaris* causeth sneezing if drank; those of *Climurnus* in *Umbria*, *Cappadocia*, and of *Cesiphus* in *Beotia* make the hair of the Cattel that drink of it grow white, but that in *Arabia* (as *Aristotle* doth attest) changeth them into a reddish colour.

Theophrastus, writing of the Fountain *Lycos*, reports it to be of the same property that Oyl is of, and to burn in a Lump, although within the Well appearing limpid. But that which is more admirable, we observe in the Church History of *Euseb.* whom *Paulus Orosius*, and *Eutropius* do second, viz. That near upon the Incarnation of our blessed Saviour, in the Reign of *Cesar Octavianus*, there brake out a Fountain in a Tavern at *Rome*,

Pppp floating

floating a whole day with abundant streams of pure Oyl.

Isidorus and *Solinus* in his *Polyhistor*. make observation of a Fountain, whereon those, that were to depose their Oath, were to lay their hand, whose eyes in case they had forsworn themselves were withered, and brought to a blindness. Had God pleased that such a fountain might have appeared near the Hals, it is to be feared that an honest man could hardly walk the streets without being affronted by a blind man.

One of the same Authors doth also witness of *Jacobs* Fountain in *Idumæa*, that every three months it groweth troubled and becomes red and green, afterwards returning to its primitive clearness. Likewise it is said of a fountain in *Cherronesus* that it sieths and ferments once a year, purging it self of all filth and uncleanness. The same is observed of many other fountains.

From the likeness of the subject I shall take occasion to appose a word or two touching the properties of some eminent Wells and Baths, differing in little else from fountains, than that these spout out of the earth with a great force and in greater abundance.

IV. Near to this City there are three Wells much cryed up for the cure of diseases, whereof two are purging by stool and urine, *viz.* *Barnet* and *Ipsam* Wells; The other of *Tunbridge* is only diuretick or moving urin. Of the two first the latter is counted the stronger, both being much approved for the curing all chronicall diseases; particularly a Tertian Ague, obstructions of the mesaraick vessels, of the Liver and Spleen, crudities of the stomach, the yellow Jaundise, and Catarrhs.

That of *Tunbridge* is more profitable in Quittanes, inveterate Head-aches, Dropfies, Gouts, Hypochondriack Melancholy, black Jaundise, Melancholy of the brain, Leprosie, Cancers, malignant and inveterate Ulcers, Kings Evil, Convulsion fits, fits of the Mother, stoppage of Courses, VVhites, Phtisicks, Palpitation of the heart, stoppage of the Kidneys and Bladder, the Gravel and Stone, the Impostume of the Kidneys, of the Mesentery, of the Liver and Spleen. But as for those that are troubled with the French Leprosie, let them beware from these waters as from poyson; for there is nothing in the world that sets those virulent humours more into rage and fury than Mineral waters.

Next to these the *Span* waters are very famous, divided into four several Wells, *viz.* *Savenier*, opening at the foot of a hillock three miles

miles from *Spaw*, its faculty is most diuretick and somewhat Eccoprotick. 2. *Pouhont* bursts out in the middle of the Village, and agreeth much in vertue with that of *Savenier*, excepting that it is somewhat more eccoprotick. They are both much covered for their pleasing sharpness of taste. 3. *Geronster* is distant from *Spaw* near three miles, but is much less in esteem than others, because of its unpleasing nauseous sharp taste, causing a disturbance of the brain, stomach, bladder, and guts. 4. *Tonnelet* retains some faculties like to the before mentioned, but much inferiour to them in strength.

V. Baths are hot Wells: hence in Latine they are called *Therma* (hot) *scil. aqua*, from *θερμος* hot. This Island affords some inferiour to none: Especially those in *Somersetshire*, whose fame hath deserved the name of *Bathe* *et* *Exon* for the Town, where they erupt out of the earth.

They are 1. *Cross-bath*, pouring out in a mild temperate heat.

2. *Hot bath*, being about two hundred foot distant from the former, and differing from the other in intenseness of heat, whence also it derives its name.

3. *Kings bath*, which is near to the Cathedral, and is less hot than the Hot bath, but hotter than the Cross bath. Their vertues are excellent in curing of most chronical diseases incident to the joynts and sinews; as Gouts, Lamenesses, Numnesses, Palsies, hard nodes and cold tumours of the joynts, Rickets in children, &c. they dry up the superfluous moisture in dropies, expel gross humours by sweat, and by that means curing inveterate headaches, aches of the Limbs; they procure womens courses, consume their Whites, cure the Green-sickness and many other diseases.

VI. A River is a collection of waters descending from a Fountain, and streaming through a tract of the earth towards the Sea, whereof some are long, others short, broad or narrow, deep or shallow, swift or slow, straight or winding; some ebbing and flowing, as the *Thames*, *Elb*, *Mase*, *Seyne*, &c. others for the most part following one course, &c.

Most of the River Waters about the Alpes, if usually drank of are apt to breed a great swelling in the throat, called by Physicians *Bronchocele*.

Vitruvius affirms the same of a River called *Silar*, changing the roots, leaves, and boughs of the trees that grow on its banks side into stones. *Pliny* adduces another of the same property, whereunto

the River near *Laodicea*, and those of the Country of *Barcia* in *Hungary* may be adjoyned. About the borders of *Norway*, near a Cattie called *New Castle*, flowes a River, whose streams seem blackish, breeding also fish of the same colour.

Philosfratus, in his book *de vita Apoll.* recites a Fountain, where in if a forsworn person doth wash his hands or feet, he is soon infected with a shameful leprosie. *Diodorus* the *Sicilian* makes mention of another of the same nature.

The water of the River of *Jordan* doth still retain its great fame among the Papists of working Miracles: Pilgrims do oft bring quantity of it along with them thence, obtesting that it is impossible it should fail curing Dropsies, Consumptions, malignant Ulcers, Kings Evil, Barrenness, in fine all diseases that surpass cure by Art. It renders the face beautiful and nitourous, and for curing spots and deforming rednesses of the face it is taken notice of by most women in *Spain*, *France*, and *Italy*.

The East Indians do adscribe the same vertues to the River *Ganges*, which they do believe with such an assurance, that as soon as ever they fall dangerously sick, they cause themselves to be carried to the River side, where they sit under a Hutt with their legs half way in the water so long untill they are either dead, or perfectly cured; and if they die they leave in their last will that their cinders may be cast into the same River, for to be purified (I suppose) against their Resurrection.

The *Egyptians* used to take their prognostications of sundry important things from the River *Nilus*, which if it failed overflowing their Country, portended barrenness, and consequently Famine, and oft times a Pestilential disease, and sometime change of Government. Thus its inundation was deficient two years together before the death of *Antonius* and *Cleopatra*; the same hapned also before the great Famine and change of Government under *Claudius*. On the other side, if the said River happen to overflow beyond its usual limits, it proves likewise an occasion of barrenness, because the length of time, before the Country can return to a just dryness through the decreescence of the water, is protracted beyond the Season of Sowing. Usually and naturally (as I may so say) the *Nile* overflows once a year, being forty daies in increasing, arriveth to its height (which is unto 16 cubits) about the seventeenth day of *June*, and is forty daies more after that in decreasing. The Countrey being

being much fatned by this inundation produces great abundance of pasture, corn, and other fruits.

The increase, height, and decrease of the *Nile* they know from the observation of a Pit made out of one stone, whose water increases and decreases with the *Nile*. This River doth also dispose women for conception, whence it is ordinary with them to multiply by twins, and three at one birth: Moreover it is a very healthfull water preserving the body in a good disposition, and curing many diseases. Notwithstanding the subtilty of the water and heat of the climate, yet it never emits vapours, whence it is that there falls no rain in that Country. The same is also attributed to the River *Boristhenes* and the *Anouros* in *Thessalia*, viz. not to rick or to occasion the air to be nebulous.

The River *Ganges* is likewise apt sometimes to exceed its bounds, through which inundation the Country is very much fertilized. The River *Arrins* of *Florence*, the *Danow*, the *Eridannus* or *Padus*, the *Tiberis*, and the *Athesis* of *Verona*, have oft caused a submerſion of the neighbouring fields.

VIII. The chief straits *or narrownesses of the sea are,

1. The straits of *Gibraltar*, where the Sea floats through betwixt the two pillars of *Hercules*, viz. The two Promontories of *Calpe* and *Abila*, and divides *Spain* from *Fez*; it is otherwise called the straits of *Caliz* from the Island *Caliz*, near adjacent to it. Its breadth is about seven Leagues.

* These should have been inserted in the preceding Chap.

2. The straits of *Anjan* passing from the outermost western parts of *America* to the Eastern Coasts of *Tartary*. It is very probable that some of the posterity of *Sem* crossed these straits to inhabit the West-Indies, where they are since multiplied into those several nations.

3. The straits of *Magellan*, so called from him that first passed them; but since they have found another way into the Pacifick Sea more commodious to sail through, called the straits of *Le mair*.

4. The straits of *Davis* towards *Greenland*.

5. The straits of *Nassow* or *Waigats* near *Nova Zembla*.

The Mediterranean is pinched by these straits: 1. The *Sicilian* straits. 2. The *Tuscan* straits between *Sardinia* and *Corſica*. 3. The *Calydonian* straits. 4. The straits of *Euripus* between *Achaia* and *Eubœa*. 5. The straits of the *Helleſpont*. 6. The *Thracian* straits. 7. The *Cimmerian* or *Meotian* straits. 8. The straits of *Cilicia* or *Caramania* between *Cilisia* and *Cyprus*. A Gulph

A Gulph is an arm of the Sea, or the Sea broken into the Earth in the form of an Arm. The principal Gulphs of the Oriental Ocean are :

1. The great Gulph passing betwixt *Mangi* and *India extra Gangem*.

2. The *Gangetic* Gulph streaming between the Golden *Chersonesus* and *India intra Gangem*.

3. The *Persian* Gulph.

4. The Gulph of *Arabia*, or the red or *Erythrean* Sea deriving its name from the red Sands over which it floats, or according to *2. Curtius* from the King *Eristhra*.

5. The Gulph of *Canthus*.

6. The Gulph of *Barbary*, or *Procloatis*, or *di Melinde*.

The principal Gulphs of the Western Ocean :

1. The *Sarmatian* Gulph.

2. The *Granducan* Gulph, or white Sea.

3. The Gulph of *Mexico*.

4. The Bay of *Biscay*.

The Mediterranean Sea is chiefly dispersed into these Gulphs :

1. The Gulph of *France* reaching *Marseilles*.

2. The *Adriatick* or *Venetian* Gulph.

3. The *Ionian* Gulph floating towards *Epirus* and *Macedonia*.

4. The *Corinthian* Gulph, alias the *Crisean* or *Alcionian* Sea.

5. The Gulph of *Naples*.

6. The *Pamphilian* or *Iffican* Gulph.

7. The *Thermacian* or *Theffalonian* Gulph.

8. The *Argolick* Gulph.

9. The black Gulph.

CHAP. VII.

Of the Circulation of the Ocean.

1. *That the disburdening of the Eastern Rivers into the Ocean is not the cause of its Circulation; neither are the Sun or Moon the principal causes of this motion.*
2. *The periodical course of the Ocean. The causes of the high and low waters of the Ocean.*
3. *How it is possible that the Ocean should move so swiftly as in 24 hours and somewhat more to flow about the terrestrial Globe.*
4. *A further Explanation of the causes of the intumescence and demerescence of the Ocean. The causes of the anticipation of the flood of the Ocean.*
5. *That the Suns intense heat in the torrid Zone is a potent adjuvant cause of the Oceans Circulation, and likewise the minima's descending from the Moon and the Polar Regions.*

HAVING in one of the Chapt. of the precedent Book posed a demonstrative and evident ground of the universal course of the great Ocean, and the straitness of that Chapt. not permitting the finishing of the fabrick intended by us upon it: Therefore this present plain shall serve for to compleat the delineation thereof, but encountering with some rocky stones thereon, it is requisite they should be rowled aside, before the said Atlantick waves may procure a necessary assent of the true cause of their dayly circular floating.

The conceit of some Philosophers hath induced them to state the copious irreption of many large and deep Rivers into the *Eoan Sea* for the principal cause of its circulation, the which tumefying its body do thereby press it westward. This solution seems void of all reason, the evacuation of the presupposed Rivers having no proportion to the replenishing of so extended a body as the Ocean, scarce of a Lake or an inland Sea, as we have observed of the lake *Haneygaban*, and the *Euxian Sea*. Besides many great Rivers disburdening themselves into the *Occiduan Sea* might upon the

the same ground return the course of the Ocean Eastward. But imagine it was so, why should not the said tumefaction rather incline the sea westward, than further eastward? Others rejecting the former opinion have in their fanſie groven the ground, whereon the sea beats, deeper and deeper towards the west, and so the ground being situated higher in the East, shelving down gradually to the west, the sea doth through its natural gravity rowl it self to the deeper & lower Plane; but then the eastern waters being arrived to the west, how shall they return to the east again for to continue the said motion? Wherefore this opinion may take its place among the Castles in the air. Shall we then ascribe the cause of this motion to the rarefaction of the sea through the beams of the Sun, which as it is successively rarefied doth swell and press its preceding parts forward? As touching the Moon she cannot come into consideration here, as being rather noted for condensation than rarefaction.

First, I deny that the Sun doth any whit rarifie the Eastern Ocean; because according to their *Tenent* the rarefaction of the sea happens through the commotion of the subsidencies and terrestrial exhalations contained within the bowels of the sea and scattered through its substance, whereby it becomes tumefied, which I grant in case the Sun casts its beams obliquely into the depth of the Ocean; but I prove the contrary, supposing the Sun doth cast its beams directly into the Eastern waters. In *Egypt* it seldom rains, because the Sun casting its beams directly into the waters doth through the same degree of heat, through which it might raise vapours, dissolve them again, likewise in the East Ocean the Sun subtilizing the waters doth doubtless through its heat commove exhalations and subsidencies, but the waters being through the same heat attenuated are rendred incapable of sustaining those terrestrial bodies, wherefore they sinking deeper to the ground rather cause a detumescence of the sea. I have alwaies observed that waters swell more through the cold than heat, and that inundations happen for the most part after a frost; besides it is obvious that Rivers are much tumefied when they are frozen, and that by reason of the foresaid tumefaction inundations happen more frequently in the winter than at any other time of the year. *Des-Cartes* imagineth the compression of the Moon (together with the Earths motion about her own Axis) to be the cause of the waters circular motion, pressing it from East to West, and the variation of this pressure

to depend upon the various removal of the Moon from the Center of the Earth effecting the anticipation and various celerity of the waters motion: So that where the Earth is obverted to the face of the Moon there the waters must be at their lowest, being pressed towards the next quarter of the Surface, where they are at their highest, whence they are carried about through the Earths proper motion, &c.

1. I deny his supposition of the Earths motion, as being fabulous, which we have confuted elsewhere. He might as well assert, that there be as many *Neptunes* under water moving it circularly, as *Aristotle* stated intelligencies to drive the Heavens, for even this he might excuse by saying it was but an Assumption to prove a Phænomenon of the water.

2. What needs he to affirm a tumour of the water? for since he assumes the Earth to move circularly, we cannot but grant that the water must also move with it as constituting one Globe together.

3. Why doth he in vain reassume in the 55 Sect. that out-worn *Doctr.* of *Aristotle* touching the Moons driving of the water, which argues him to be very unconstant with himself?

4. His stating the air to be so complicable and soft a body renders it very unfit for compressing and driving so vast and weighty a body as the Ocean.

5. Can any one rationally or probably conceive, that the Sun, much less the Moon, being so remote, and whose forcible effects are so little felt by sublunary bodies, should be capable of driving so deep, so large, and so heavy a body as the Ocean, which is as powerful to resist through its extream gravity, as all the Celestial bodies are potent to move through their extream lightness? What, because the Ocean and the Moon move one way, therefore the one must either follow or move the other? What, can a passion so durable and constant, and so equal depend upon a violent cause? Since then such phantasies are ridiculous, and not to be proposed by any Philosopher, let us now proceed in the unfolding of so difficult and admirable a matter as the course of the Ocean, which we have formerly demonstrated to flow about the earth once in 12 hours and somewhat more.

II. Moreover, besides this single motion making a sharper inspection into the drift of the Ocean, it will appear to us to absolve a

*Or 30 single periods.

*Hence you may collect the cause of the retardation of the tide every day.

compounded periodical course in a perfixt time, namely, in 15 daies, which space may be called a marinal or nautical month. The meaning hereof is, imagining a part of the Ocean to flow circularly from a certain point, or more plainly, a Bowle to rowl circularly under water over the bottom of the Sea along with the course of the Ocean, from any noted point, that the same part of the Ocean or Bowl shall in the space of 15 natural daies * arrive to the same point, and exactly at the same time begin its next periodical course thence, when it departed from that term the month before. Nevertheless the Ocean doth not omit its single course in fluctuating about the Earth in somewhat more than twelve hours, but then it doth not dayly arrive to the supposed point of a compounded periodical course at the same minute, when the latter (*viz.* the compounded) begins its progress. Expresly, the great Ocean through its diurnal course flows the length of 348 degrees about from East to West, performing also the same circuit through its nocturnal course: That is, every twelve *Æquinoctial* hours it absolves 348 degrees of the terrestrial *Æquator*: Wherefore for to flow 360 degrees it requires $24\frac{24}{29}$ minutes of an hour above the foresaid twelve hours: that is, the Ocean flows about the terrestrial *Æquator* in twelve hours, and $24\frac{24}{29}$ minutes, absolving every hour 29 degrees *. How this swiftness is possible to the Ocean we shall make further declaration of it anon. Besides a single diurnal, and a periodical compounded monthly motion, another must also be added, which I call an *augmentative motion*, through which the Ocean doth gradually accreate every high water to some certain cubits; of which more fully hereafter.

Since that time is nothing but a measure of motion, and that one time is made known to us by another, it is thence occasioned that we come to know the time of the Ocean by comparing it with the time of the Moon and of the Sun, as being general marks whereby to calculate the seasons of the Ocean. This premised it states a ground & reason of the measure of this great Sea, *viz.* That it is usually high water in the Ocean under the *Æquinoctial* and *Ecliptick*, as also upon the shores of the same at six in the morning and evening, when the Moon is in opposition to, or conjunction with the Sun, and at the same hours about the Moons quarters the waters there are at their lowest. On the other side, it is as common among Mariners to measure the motion of the Sun and Moon by the

the Tides or motions of the Seas, they being exquisitely skill'd in discerning the hour of the day and night, or the season of the several aspects of the Moon by the said tides; Wherefore it may be thought as equal a consequence that the Moon in her motion depends upon the course of the Ocean as pressing the air through her tumefaction, which again doth impel the Moon forward, as that the Moon should tumefie the air, and thereby impel the waters forward: But I pass by this as ridiculous.

Although the Ocean keeps so constant and exact a rule and measure in its course, as likewise the Sun and Moon, yet we must not therefore conceive the one to depend upon the other, because two great marks of their time (that is one of either, *viz.* The greatest height of waters and the greatest aspect of the Moon) are concurring in one day, that rather happening, because the Ocean began its course at that instant, when the Moon after her creation being placed in opposition to the Sun began hers. But possibly you will propose this instance to evince that the highest water doth depend upon the greatest compression of the Moon, because when she is at her Full, she may cause some compression and commotion of air and water, she then being in her greatest strength, and situated in *Perigeo* of her eccentrical Aspect, and therefore nearest to the water, and so may add somewhat to the enligning of its stream. I answer, That it is a mistake to apprehend the Moon to be nearest at the Full, most Astronomers asserting her rather to be remotest then, and to be nearest when she is in her quarters: *Ergo* according to that rule the highest waters should happen at the Moons quarters, and the lowest at the Full of the Moon: Or otherwise, how can the Moon further the said motion, when she is upon the extremity of her decrease, her rayes drowned by those of the Sun, and she in *Apogeo deferentis*? Certainly, none can be so obtuse as to maintain her in that capacity to have a power of compressing the air, when she being most remote the air doth most enjoy its freedom; yet nevertheless some are so obstinate to assert, that the greatest Altitude of the Sea because it hapneth then, doth likewise depend upon the compression of the Moon. What is more constant, certain, periodical, and equal than the course of the Sea? Whereas the Moon is vulgarly maintained to be subjected to anomalies; then in this part of the Heavens, then in another; now in *Apogeo, perigeo, concentric, excentric*, then swift, slow, &c.

if so, then a constant and equal effect cannot consecute the efficiency of an unequal cause.

III. Against our discourse touching the diurnal course of the Ocean might be objected, That it seems very improbable, that the Sea should move so swift, as in a little more than 12 hours to overflow the whole terrestrial Globe; whereas a ship through the advantage of her sails and a prosperous wind and weather, being supposed to out-run the Tide, can scarce accomplish that course in a Twelvemonth. Hereunto I reply, that the water takes the beginning of her motion from underneath; for as I have formerly proved, that the formal cause of the waters perennal motion is her gravity, which bearing down upon the Earth for to gaine the Center, is resisted by her, and nevertheless continuing in its motion is necessarily shoven there * to the side; and so the same hapning to the succeeding parts are all impelled through a natural principle of gravity sidwards, like unto an Arrow being shot against a stone wall, and there resisted, is shoven down the side. VVhence it is apparent, that the waters take beginning of their motion underneath not far from the ground, where being pressed by the great weight of many hundred fathoms of water lying upon them, must needs cause a very swift course of waters removing underneath and withdrawing from that of the Surface, which is prevented of a swift motion, because it sinks down to that place whence the subjected parts do withdraw themselves; which gives us a reason, why the superficial parts of the Sea do not flow by many degrees so swift as the subjected ones. Nevertheless some small motion is visible upon the Surface, which may accelerate or retardate the course of a ship, but not comparable to the waters in the deep. This instance will further certifie you touching the truth of the matter before said; a flat-bottomed Kettel filled up with water, having a hole at the bottom near to the side of the said Kettel doth emit the water underneath spouting out with a very great swiftnes through the hole, whereas the water upon the Surface moverh but very slowly towards the side near the hole, because the water moving so swiftly underneath doth cause that atop to sink upon it which prevents its swift motion towards the side, and that which causeth the water underneath to spout so violently out of the hole is the weight of the water atop pressing violently and forcibly downwards. This occasions me to call to memory that apposite Phrase of the Dutch sea-

* Namely
at the bot-
tom under-
neath: ergo
the waters
must also
begin to
move from
underneath

sea-men, who instead of saying the water ebbs, say *Het water sackt*, that is, the water sinks, as if they would signifie the water to move from underneath.

The Ocean then originally and primarily moving from underneath in a very swift current, as the forementioned instance may easily confirm to us, hath not that extent to overrun there, which we might conceive it would have atop, but is above the half shortened in its periphery through its depth, and consequently through the deep excavation or extenuation of the Earth: Wherefore observe, 1. That the Ocean underneath doth well absolve so many degrees as we have writ down before, but then they are much abbreviated and lessened in comparison to those degrees, whereby the superficial circumference of the water is measured.

2. I say, that the Ocean absolves the foresaid course of 348 in 12 equal hours only in its lower parts; But as touching its superficial ones it is certain they are slow, absolving the same compass in no shorter time than six months, which may be named a Marinal year. This slow progress is evidenced to us by the slow drift of a piece of wood floating in the Ocean.

3. Although the superficial parts of the Ocean do not flow with so rapid a course, yet it hinders not, but that they may tumefie as they do throughout their whole circuit about the Earth in the space of 12 hours.

4. Since it must necessarily follow, that where the water tumefieth in one place, it must sink in another, therefore the water tumefying once every 12 hours in the East 6 hours long, (in which space it arriveth to its height) it must sink as much in the VVest, because that moisture, which causeth the intumescence in the East, doth flow underneath from the VVest. By the same rule the Eastern Ocean must also sink 6 hours in every 12 for to cause a tumefaction in the VVest: VVhence it is, that every 6 hours we perceive a change of the Tide in the Ocean.

5. VVe are not to perswade our selves, that the Eastern flood is occasioned by water returning from the VVest, and the western flood through the reflux of the same water from the East, because the Ocean doth continually pass from east to west by way of the South, not returning the same way through the South from west to east, as appeareth by the quick Voyages of those, who setting

sail

fail with a good wind and weather from *Spain* towards the West-Indies do usually make land in three or four weeks, whereas returning from thence can scarce recover *Spain*, although having the wind very favourable, in less than three or four months. Likewise a voyage from *Moabar* in the Indies to *Madagascar*, otherwise called *St. Laurences* Island, may be accomplisht in 20 daies, but from *Madagascar* to *Moabar* scarce in less time (although with a very prosperous wind) than three months: In the same manner one may much sooner make a voyage from this Island to *Spaine*, lying hence more eastward, than from *Spain* back again hither, or in sailing from *Alicant* (a City of *Spaine*, situated upon the Mediterranean Coast) towards *Palestina*, they usually make less speed than in returning. All which are undoubted marks of the perennal course of the Ocean from East to west. VVherefore Philosophers have been misled in imposing the names of *Fluxus* and *Refluxus* upon the course of the Ocean as if returning the same way it went. I have taken notice, that as the Dutch used a fit word for to denote the Ebb, so the French have imposed another no less elegant upon the flood, viz. *La Montè de la Marè*, or the rising of the Sea, exactly squaring with our foregoing discourse: Thus when it is flood they usually say, *La marè il monte*, that is, the Sea rises. The Latinists call it *Ætus Maris*, or heat of the Sea, because when the Sea begins to be filled with hot exhalations, it is wonted to be hot, through which it swelleth, (like hot blood flushing into our faces and glowing causeth a puffing up and a rising) whence it is impelled to flow some part of it one way, and another another way, which caused the flood, observed through the rising of the waters upon the shores: These exhalations being dissipated, the Sea beginning to cool withdraws it self again into its former compass, and leaving the shores puts them in mind of the Ebb. But this dictate being proved to be absurd doth justly advise us to reject the forementioned name.

6. VVe need not to doubt being fully informed of this Doctrine, but that every flood brings in new water, that of the last Ebb flowing forwards with the course of the Sea towards the accomplishment of its annual period.

7. Let none be offended at us for granting an internal cause of the Seas motion against *Scalig. Exer. 52.* asserting the Sea to be an Animal in case it should be moved from an internal cause; were this a Paradox,

a Paradox, we must then believe that the Air, Fire, Heavens, and Stars are Animals, they all moving through an intrinsic principle.

IV. My method doth now lead me to demonstrate the several *Phanomena's* of the Ocean by their proper causes.

I. The Ocean flowing from East to West cannot be thought to be the sole cause of the diurnal *intumescence* and *detumescence* of the Sea, since it may be supposed to flow equally over an equal ground: Wherefore a second cause must concur, to wit, an unequal ground, or an unequal grove, through which it passeth. The waters being through the second division of the Creation separated from the Earth, which then lay in an equal round figure under the waters, these consequently equally covering it in the same figure, were afterwards through the third division collected into one place, where they must have pressed their great weighty body into two great universal groves *, whereupon the Earth must necessarily be pressed up into two great universal eminences, which are divided from one another through the said waters, and consequently constitute two great Islands, *viz.* of the New world or *America*, and the Old world, or *Asia*, *Africa*, and *Europa*. The Sea after this working through its great weight deeper and deeper into the Earth must necessarily thereby have formed many other deep and great cavities within the said universal groves. The Earth, through whose recess or giving way, the said other Cavities were impressed must needs have been compressed to some other part: not towards the center, because the Earth was so very densely beset there, that it was impossible it should give way: *Ergo* towards the Surface, where it was moulded and compressed up into all those great mountains, which we see every where about the Sea-shores, and into all those great Banks and Rocks which Sea-men do meet withall every where; yea, some being stuffed up a great way from the shore, as witness many Ships that have run aground in the Atlantick Ocean above 60, 80, or 100 Leagues from the shore; likewise a great banke lying off the Cape of St. *Austin*, and extended near 70 Leagues long. Lastly, A great part of the receding earth was cast up into great and small Islands, especially those numerous ones in the East and West *Indies*.

Let us then suppose those said small Isles, together with the great ones of the East *Indies* to be accompanied with great and large banks

* Namely
the west
grove.

banks or shelves, whereof some are visible, others not; This supposition must needs force another from us, *viz.* That the waters passing from West, by the North to the East, are retarded and partly stoppt by the said Isles, shelves or banks: In the mean time during this retardation and partial stoppage, the waters flowing from East by the South to West do decurre, decrease, and evacuate themselves unto the west grove, untill such a degree, that they are run off as low as possible, at which time the other * is at its highest, and then they overflow the borders of the Eastern shelves, and free themselves from the retention of the Isles, by which means the Eastern grove begins to fill and encrease, whose swift decurrence of waters being stoppt and retarded by the Western borders and banks fills up until high water. This discourse may seem strange to you since the waters are never visibly stoppt by any shelves or banks, these alwaies lying covered; but were it so that they proved a stoppage, it must be imagined they should lye dry. Hereunto I answer. That supposing the waters to move from underneath, they arriving at a deep grove must needs be retarded through its shelving sides, as being against their natural inclination to move upwards. This retardation of the water on the bottom of the grove must necessarily cause the waters atop to swell and become turgid or tumide, ever framing a round figure atop, which is a certain sign denoting the grove to be of a parabolical figure. This tumefaction the Ancients did abusively term an *exesnation*, as if proceeding from a fermentation within the water. The water underneath being depressed on the bottom of the grove according to its greatest capacity, and having withall elevated the waters atop to their greatest height, doth now begin to strive to clime up the shelves of the grove, being thereunto moved through its own force continuatued against the Earth, but reflected by the same upwards, and propelled by the succeeding parts of the water, as also compressed and squeezed by the greatest weight of the waters atop lying upon them, which compressing is much augmented by the great force of the air and fire bearing against the water and earth for to gain the Center: Whence the waters do now begin to flow over the banks of the said shelves, making a tumefaction and gradually a high water wherever it comes, and so evacuating it self out of one great grove into another happens to cause a low and high water in the Ocean. Hence now you may easily collect the reasons and causes of these several properties befalling

befalling the Ocean in its diurnal course.

1. Every twelve hours there appears a rising of water in either of the universal groves *, viz. South and North grove continuating the space of 6 hours, because the bottom of either grove is 6 hours in filling out of the one into the other. Likewise every 12 hours the Ocean fills for 6 hours, because its water beneath is so long in evacuating it self,

* Take notice by the way, that by Grove I do not intend any thing like to a Grove of trees, as the word is derived from growing; but a cavern, as the same word is derived from Groven or to grave into the earth.

2. The beginning of the swelling of the Ocean is ever slow for two hours; much quicker the next two; for one hour before the last is quickest of all: and the last moves in an equal velocity with the latter of the two first; it is at its slowest a little before the pinch of high water & at dead low water. The beginning is slow, because that part, which causeth the beginning of the tumefaction of the water, is weakest as being most remote from the central parts, and employing its greatest force in making way and mounting over the shelves loseth its strength, which it recovers when it is backt by the body or central parts of the water following it, and so promoting its course with a greater swiftness: And being with its whole body arrived to the bottom of the grove it doth as it were rest there for to recover its strength, which doth occasion its greatest slowness, the same consequently causing the greatest diminution of motion at low water in the other grove.

3. High and low water of the Ocean is retarded every natural day near three quarters of an hour, that is $24\frac{3}{4}$ minutes of an hour in every single period or 12 hours, because it accomplisheth but 348 degrees of the terrestrial Equator in every 12 hours, which doth want 12 degrees of its compleat circuit, and before it can absolve those 12 degrees through the beginning of a new period, there passeth $24\frac{3}{4}$ minutes of an hour, which gives us the true reason of the Oceans retardation every day near three quarters of an hour. This course lingring every natural day so many minutes, doth in 30 periods or 15 daies stay back full 360 degrees, being the total circumference of its circuit, and so, as it were, absolves a compounded period through its retardation in 15 daies, which space agreeing with the time of the Moons middle motion between her conjunction and opposition, no wonder, if the Ocean also agrees to be at its height at a prefixt and constant time, alwaies being one and the same, when the Moon her aspect is New or Full.

4. The Ocean happens to be augmented or elevated higher than ordinary every Full or New Moon, because every thirtieth or middle period, (which ever falls accidentally, but not as if only depending upon the Moon, as upon her New or Full Aspect) it hath acquired its greatest force of flowing, whereby it drives before it and carrieth along with it a greater confluence of water than at any other season. This intention of course it procures gradually more and more every period, untill at last it comes to its highest, after which in like manner it decreases again, untill it is descended to its least remission, which is upon every thirtieth circuit coincident for the most part with the Moons quarters; that is, the Ocean at its high water is in comparison to the high waters of the other precedent or following courses at the lowest, when the Moon appears in her quarters, because the force of the Oceans course is then most remitted. Here we may observe the beginning of this intending or periodical compounded course to be, when the Ocean moves with the least force, causing the lowest high water, and the highest low water, which frequently happens near to the Moons quarters, whose middle is marked by the Moons Full and New Aspect, being when it flows with the greatest force causing the highest high waters, and the lowest low waters, and tends towards its ending, when it remits from its height and intends in lowness. This augmentation and diminution may be resembled to the fermentation of Wine or Beer, swelling gradually untill its height, and thence decreasing again. Touching the beginning and ending of the Seas single diurnal circuit, if we consider it *simpliciter*, it hath none, because it is ever in motion, as never being eased by a total rest; but if agreeing to state the beginning, where the Ocean is slowest in its course, and thence tending to a swifter motion, then the Proposition is resolveable: And according to this Supposition, the beginning and ending must be moveable, differing every single course near 11 degrees; This by the way: Returning to explain the cause of the gradual augmentation of water, and intention of force, I am to remember you of the great proportion of the Oceans peregrin Elements consisting of most Earth, then Air, and lastly fire, of whose close coherence with the waters, their saltness is an undoubted argument: These salin particles violently detaining the waters from recovering the center, must necessarily add force to the gravity of the waters, and consequently in intending their

their force they must also augment them in quantity, because the more force the waters use, the more in quantity they bear along with them. The detention of the said salin particles being at their beginning of no great strength, or in no great quantity, do therefore cause no great intention of the Oceans force, but every single period piercing gradually by rarefaction upon the waters, must necessarily also augment their tumefaction gradually higher and higher every day, untill at last being arrived to their height of penetration, which ordinarily happens in 15 circuits, the Ocean is likewise elevated unto its height. Some of these salin particles, being penetrated through the body of the waters, are gradually depressed to the ground through their own disposition, and the weight of the Ocean, others being attrited and confused through their passive motion against the water, and the decess of their heaviest particles do more and more gradually desist from their violent detention, every circuit, returning to the bottom, and so the Ocean doth also gradually every day incline nearer and nearer to its natural force and detumescence of its water, untill it is returned to its own proper course, at which season its force and intumescence are equally at their lowest. During this space those subsiding particles begin again to be expanded, rarefied and attenuated, because of the grinding of the water against them, and through the expansion of the aerial and igneous parts adunited to them do bear up again: The others elevated atop beginning to concentrate through the quiescence of the Sea, are ready to be compressed downwards both which gradually striving a reciprocal meeting do in the foregoing manner gradually reunite the force and augmentation of the Water.

V. Here we cannot but admit the Suns intense heat, every day, beating down the torrid Zone, to be a great instrumental and adjuvant cause to the stirring of the aforesaid salin particles: But this continuing in one measure, equality, and station in respect to the torrid Zone all the year long cannot in any wise be thought the principal cause of a motion varying twice every day.

Likewise the Moon being beset with a great quantity of dampish and heavy particles, doth every day spread down some of those particles, whereby the Ocean is also gradually filled more & more every day: And like as these said particles are most apt to rain down, the nearer the Moon doth appropinquate to the Ecliptick, because the air enjoyeth a greater subtilty there from the rarefaction of the

Sun ; hence it is, that the Moon frees her self most of these heavy concomitants near her Conjunction and at her apposition : So they are most apt to ascend the further the Moon is declined from the Ecliptick, as happens in her quarters, when for that reason the waters are also at their lowest. That these two Lights are accidental causes of the intention of the Oceans force and daily augmentation of its waters is plain enough, and their mutual concurrence to the effecting of the same effect we have confirmed beyond all doubting, whereby the absurdity of the Moons compression proposed by *Des-Cartes*, and so disagreeing with his own position of the nature of the air, is likewise set before you.

The Moon near her Conjunction makes very high waters, because conversing with the hot rayes of the Sun sends down a great number of the foresaid bodies, and not because she is impregnated with the light of the Sun, whereby she should be grown more potent to excite vapours and exhalations : This is ridiculous, for we find other bodies to be swelled near that time not only through exhalations raised out of themselves, but particularly through particles demitted by the conveyance of the air into their pores. The like happens, although in a weaker manner, when the Moon is in her full Aspect, because of her nearer approximation to the Ecliptick : But much more in a Lunar Eclipse, because she is then found directly in the Ecliptick. And most of all, yea twice higher than ordinary at the Full Moon of *March* and *September*, because the Sun being then in the *Æquinoxial*, and most directly over the torrid Zone, under which the greatest body of the Ocean floats, and the Moon in the same way near the Ecliptick, must needs joynly cause a vast decidence of the forenamed bodies intending and augmenting the waters.

Or to declare the matter plainer to you : The continuation of the Seas Motion forward is not only depending upon the pulsion of succeeding parts bending by refraction naturally forward, but also by a kind of attraction or suction of preceding parts, thus : Suppose the Earth to be excavated into certain great cavities, like to great pipes, whereof of those that are formed from the East towards the West by the South the furthestmost are alwaies deeper and longer than those, which are nearest to the East ; Likewise conceive such Cavities framed in the same proportion to one another from West back again to the East by the North ; Now I say, that the deepest

deepest and furthermost cavity must alwaies attract the water out of the shallower and lesser, in the same manner, as the longer pipe of a sucker (a Siphon as some do call it) must attract all the moisture of the shorter, because the parts of water being continuous, and consequently cleaving to one another, the lesser part must follow and yield to the greater, the which through its crassitude being pressed forwards must also draw the lesser part after: Since then the water is no sooner arrived into one cavity but is thence drawn into another, hence it is that this tumefaction of waters is not sensible to us in the Ocean. The number of these cavities we must suppose to be fifteen on each half of the terrestrial Globe; because the Sea doth in every periodical compounded course make thirty stations, or so many tumefactions, by which it must needs work it self into so many cavities. This supposed, it doth infer another assumption, viz. That since the Ocean moves over so many borders or shelves of cavities, it must necessarily move in Bores: A Bore (or more properly a Bare) is a tumefaction of water underneath moving very swift, and elevating the waters atop into a tumefaction proportionable to it underneath: An example of Bores you have in the River of *Seyne*, and many other Rivers, where great shallows obstruct the flood of the waters underneath: But of this more hereafter. The Ocean then moving in a great bore must raise a tumefaction, wherever it passeth: This tumefaction being originally in the middle parts causes the flood by sending a proportion of waters (falling through their gravity from the top to the sides as being lower situated) to the coasts on both sides which it passeth. Hence we may collect that where ever the borders of the foresaid cavities do respect the Coasts, there the Inhabitants must have a swift appulse of the flood. The Ebbe is nothing else but the waters returning from the sides to the middle parts, being left lower through the recess of the Oceans bore or tumefaction: but this by the way.

It is most certain, that the Western Ocean directs its waves towards the East; but whence this continual course of water is supplied may justly be doubted, and although the Eastern Ocean doth constantly flow towards the West, yet how and where *Mar del Nort* meets with *Mar del Zur* remains to be made to appear. Their visible communication through the straits of *Magellan*, or of *Eimaire*, or the straites of *Martin Forbisher*, and of *Anjan*, cannot be imagined to conduce any thing considerable towards the supposed

posed evacuation; that of *Magallan* little exceeding a League in breadth, or above 10 or 12 fathom in depth, besides the many turnings and windings and length of near 110 or 120 Leagues hindering any considerable course of water: The others not much surpassing these either in breadth or depth seem to conduce as little. But to make the course clear beyond all dispute the West-Indian Earth is bored through deep underneath by the former compression of the Ocean, through which immense perforation the great bore of the Sea enjoys a free passage, and rowles along under the Peruvian Ocean. By means of this vast perforation the Indian Earth is much elevated, and in most places hath acquired the full height, which it obtaineth being come up atop the Sea by many Leagues, whence it is that the Land by far overlooking the Ocean doth appear to Mariners three or fourscore Leagues off at Sea.

CHAP. VIII.

Of the course of the Sea towards the polar Coasts.

1. *What the Libration of the Ocean is. That the Tides are not occasioned by Libration. The Navil of the World. Whence the Seas move towards the North Polar. Why the Ebb is stronger in the Narrow Seas than the Floud; and why the Floud is stronger than the Ebb in the Ocean. Why the Irish Seas are so rough.*
2. *Why the Baltick Sea is not subjected to Tides. The rice of the East Sea or Sinus Codanus.*
3. *The cause of the bore in the River of Seyne.*
4. *The causes of the courses of the Mediterranean. The rice of this Sea.*

I. **H**itherto we have followed the main course of the Ocean Westward: In the next place let us cast an eye towards the Northern coasts, where we shall meet the Sea rowling contrarily, now from the South to the North, then from the North back again towards the South. This contrariety must not perswade us, although

although authorized with *Scaligers* subtilty, that the Sea is an Animal, neither need we to lay hold upon that notion of the *Libration* of the universal waters for to salve this doubt: However I will not think it much to tell you the meaning of it. The *Libration* of the Ocean is the projection of its parts from the Center to the Circumference through a diurnal fermentation raised by the torrid rayes of the Sun, or according to *Libavius* his droling, through a diurnal-egurgitation of water out of a bottomless pit of the Ocean (called its navil) and projected toward its extreame parts. As this kind of spouting should be the cause of the flood, so its returning back into the Earths tun belly, or the cessation of the foresaid fermentation should be the cause of the Oceans reflux from the said parts, be they Northern or Southern, &c. The exposition it self of this subject will evert its supposed reality, for if such a fermentation were granted, the Ocean must at one and the same time move to all the points of the Compass, and at the same time return from the same points to the Center; But what expert Mariner is there that will not testifie otherwise? And where is this Center? Possibly in the torrid Zone between *Madagascar* and *Los Romeros*, where a very strong tide is generally observed, but not moving Eastward and Westward at one time; if so no Ship could pass without yielding her self to the bottom. Neither can *Libavius* his fanisie be admitted, because such a *Gurges* spouting out would cast Ships from it at one time into all parts with an unimaginable force, and likewise would attract Ships from those parts back again with no less force and swallow them down into her belly. That these properties would necessarily accompany such a vast Whirl-Pool is proved by that dangerous Whirl-Pool in the North sea near the coasts of *Norway*, by Mariners called the Navil of the world, through its egurgitation casting Ships to a great distance from it, and through its ingurgitation drawing them from the same distance into her throat. These *Hypotheses* insisting upon no sparke of appearance, we are forced to make choice of our precedent one, whereby to demonstrate the different flowing and ebbing of these narrow Seas towards and from the Septentrional Polar. There be few but knows, that the Narrow Seas undergo a gradual tumefaction & a rowling up of their waters, being withal very swift, and arriving successively from one coast to another; as also a successive detumescence and decurrence of the said waters. Now the reason why these waters do not accompany,

accompany the Ocean from the East towards the West, is their shallowness and inclosure between narrow borders : For the bore of the Ocean coming rowling down the *Æthiopian* Ocean towards *Mar del Nort* is discontinued (as it were) in its depth through the shallow bottom of the polar Seas, and therefore doth only give them a cast or throw in passing : For the bore arriving and swelling gradually doth through that gradual swelling squeeze the shallow polar seas towards the Poles in passing by notwithstanding continuing its course Westward : The bore being passed the Ocean beginneth to wax detumescent, whereby the shallow waters being dejected of the squeezing Ocean do return into the Ocean. The universal intumescence passing twice every naturall day doth cause a double change of the polar Tides in the same time. That swiftness, which befalls our Tides in these parts, is likewise caused through the shallowness of waters, which are necessarily impelled swifter forward, than if they being imagined to be deep, where consequently waters being in a great confluence more weighty must move slower. Hence we may learn the reason, why the tide in some places doth move swifter than in others, namely, because the Sea is more shallow there, and therefore Ships arriving near the shore make a greater benefit of the Tide, than far from it. The Floud is commonly weaker and slower, near the shores, and within the compass of these narrow Seas ; but the Ebb is stronger and swifter, because the waters do clime upwards being forced against their natural impulse, and therefore resist more potently, but returning do descend fortified with their own natural inclination into places detumesied, and therefore meeting with no resistance. On the contrary, in the middle of the Ocean the floud or rather intumescence is stronger and swifter than the ebb or detumescence, because the universal bore, which is the cause of the floud or intumescence of the water doth cause a greater impulse of the water atop through her presence than when she is quite passed ; Hence it is that Ships sailing from *East-India* Westward do over run a larger tract in one six houres of the intumescence, than the other six of detumescence. Those Seas, which are derived directly northerly from the Ocean do suffer a greater commotion of tides than others, than are indirectly thence descending. Hence it is, that the Irish Seas being directly opposite from the North to the Ocean do undergo more violent Tides than others, because they receive the squeezing or impulse

impulse of the Ocean directly upon them, whereas in the Channel, North Sea, and the Bay of *Biscay*, the waters do perform their Tides more moderately, because they floating under the North, the Ocean's universal impulse is much mitigated by the defence of the Promontories of *France*, *England*, and *Spain*. That, which doth further augment the violence of Tides in the Irish Seas is the shallowness of the water, and the meeting of Tides, viz. First they receive the impulse of the Ocean directly from the Southwest, passing between the West of *England* and the East of *Ireland* towards the North; then the same Ocean continuing its impulse against the west Coasts of *Ireland*, the Sea sets about the Northwest Cape of *Ireland*, towards the VVest of *Scotland*, and the stronger, because it is refracted, and, as it were, somewhat pinched by the shallowness of the *Hebrides* and other Islands; Through this thwart setting off of the Tide it meets with the Tide passing through between *England* and *Ireland*, which it beats back, and that more forcibly towards the latter end of the Flood. The Tides then meeting here and reflecting must necessarily cause very rough Seas; besides this, the German Seas seem to set off somewhat towards the Northwest of *Scotland*, where meeting with the Irish Sea do much intend the afore-said roughness. This also causes the duplication of Tides in several parts of the Irish Seas. It will not be unprofitable to observe the streams of the Tides, where Sea-men do state a general rule, viz. That the Tide sets off athwart, wherever it beats against a great Promontory: Hence it is, that throughout the Channel the Tide sets off athwart in many places from the French Coast towards the English, where the Land sticks out in great nooks: As from the great Promontory of *France* in the mouth of the Channel, and from that which is opposite to the Isle of *Wight*, and from before *Calis*, &c.

II. The Promontories do very much weaken the Tides, and clip them off from waters streaming in the Northeast; whence it is, that there is no Tide in the East or Baltick Seas; besides:

1. Because the Tide of the German Sea is clipt off by the peninsula of *Denmark* or *Futland* and the narrowness of the Sound.

2. The course of the German Sea is the easier kept off, because it floats to the Northward, whereas the Baltick Sea opens into it from the East. Hence it is also, that a great part of these Seas

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consists

consists of fresh waters, because the North Sea is not disburdened into it.

Touching the first production of this Sea, (to wit the East Sea) it is very probable that it derived its rise from a great Lake, risen in the deepest and broadest place of the said Sea, which by continuance of pressure hath bored through that large tract vvhich now is: That this is so I prove.

1. Had the German Ocean bored this Cavern, then a greater part of it vvhould have been salt, and heavy like unto the same.

2. It would then have been more deep than it is, and have had a greater opening; vvhwherefore it must needs have had its beginning from a Lake, and for that reason is very improperly called a Sea, more justly deserving the name of a *Sinus* or Gulph.

III. In many places the Sea is taken notice to rise to the height of a Pike, as before the River of *Seyne*, vvhose rising they vulgarly call the *Bare*, or bore, taking its beginning vvhith the advent of the Flood, and afterwards overflowing a great length of that River as far as *Roan* in a great height, but gradually diminishing. The cause of this is to be attributed to the depth of a Cavern encompassed by shelves and banks, wherein the Sea is collected and stayed until such time that it doth gather it self into a bare, whereby it listeth it self up and climbs up the banks, and being attended with the same force, whereby it did elevate it self, is protracted as far as *Roan*. Here again we have an evident testimony of the Seas moving underneath, confirming what I have proposed touching the universal Bore. If the waters here took their beginning of motion from their superficial parts, then a bare were impossible to arise here, because the waters are free and in no wise stopt in their motion atop; *Ergo* being stopt underneath it is undoubted, that the waters take their beginning of motion thence. The same bares you have here and there in the Seas, which occasion the oversetting of many a Ship, or the casting of them upon rocks and shelves, which they could not escape, because of the violence of the same bores. This bare is seldom visibly perceived in the Seas, because it seems to be drowned by the waves, nevertheless in many places it is. The cause of the breaking of the Sea upon banks you may easily know out of the precedents.

IV. The Mediterranean Sea undergoeth an intumescence and detumescence, although not very strong or swift; the reason of the

the latter is, because it being situated Easterly escapes the strength of the course of the Ocean flowing westwards: Only the Ocean through its continual passing by doth continually impell the waters of the straits of *Gibraltar* or the Pillars of *Hercules* inwards. This impulse of the waters inwards is much stronger at the intumescence of the Ocean, but weak at the detumescence, nevertheless the current of the Sea runs constantly inwards, because of the constant diurnal course of the Ocean from East to West; so that this constant current into the Pillars of *Hercules* is an Herculean argument, confirming the constant diurnal motion of the Ocean. That, which causeth the floud or intumescence here, is the Ocean impelling the Sea strongly underneath at its intumescence: The cause of the detumescence is the water falling from underneath the Mediterranean into the universal Cavern, because of the detumescence of the Ocean. Moreover, observe the property of the ebbing and flowing of this Sea: Through the intumescence the water is impelled Eastward, as well near the shores as in the middle: Through the detumescence or waters falling from underneath the waters of the shores do fall towards the central or middle parts of that Sea, yet somewhat westward, because the Sea doth fall from underneath westward; and notwithstanding the detumescence doth the middle of the Mediterranean float constantly inwards, although but weakly, because of the aforesaid impulse.

Hence it appears that the Mediterranean is an exact emblem of all the motions befalling the Ocean. Touching its original it is certain, that the Ocean did not form its Cavern through its constant motion; because were it so, that Sea would be largest at its mouth, as having withstood the first violence of the Ocean.

2. Because it is situated out of the reach of the course of the Ocean floating alwaies westward.

3. VVhere this Sea communicates with the Ocean, it seems rather to be its ending than the mouth of its narrowness, and it is very probable that near the creation the extremity of *Spain* and the Kingdom of *Fiz* joyned in an *Isthmus*, which since through violence of the Ocean and the pressure of the Mediterranean is bored through. The rise then of this Sea must be ascribed to the peregrin Element of water breaking out of the Earth through the concussion of the third Division, which afterwards was contained within a great rent or *Sinus* of the Earth: Neither did the *Euxian*

Sea derive its original from the Mediterranean, because of the narrowness of the Channel, through which they have access to each other: But this with most great Lakes of the World, as the *Maoris*, *Hancygaban*, &c. were formed through accidental protrusions of the peregrin Element of water, as you shall read in the next Chapter.

Among the various courses of the Sea we must not forget the inserting the causes of currents, whose waters although communicating with the Ocean, do notwithstanding make choice of a distinct motion, varying withall at certain seasons: Thus Mariners observe a strong current from *Cabo Delgado* towards the Cape of Good Hope streaming Southwest: and another floating westward from *Cabo das corremies* to the River *Aguada* of *Boapaz*. Near *Aguada de San Bras* the current runs towards the Land. The cause is the different position and degree of depth of their Cavity, which varying from that of the Ocean do suffer their waters to be squeezed to a different course: Neither must any imagine that the wind is the principal cause of these currents, and much less of the universal Tides of the Ocean, because the stronger the wind blowes against them, the stronger they float against the wind.

CHAP. IX.

Of Inundations.

1. Of the rise of the great Gulphs of the Ocean. The causes of Inundations. That the Deluge mentioned in Genesis was not universal. The explanation of the Text.
2. The manner of the Deluge. That it was not occasioned through the overflowing of the Ocean.
3. That there hapned very great Deluges since; when and where.
4. The effects of the first Deluge.
5. Inland Inundations.

1. **T**He Ocean and others of its Arms, through their continual violence against the Earth do in time bore great Caverns into her body, whence the great Gulphs of *Bengala*, *Persia*, *Arabia*, *Mexico*,

Mexico, most great Bayes and straits took their beginning, and no wonder since they were moulded by the strong stream of the Ocean floating westward. Neither is the Ocean satisfied of the Earth for possessing the Center (for which they have both an equal claim) in making such assaults upon her, but is still striving to enter and begin new irruptions into her, whereby it oft grows victorious of some of her Plains, as appears by those frequent inundations sustained in *England*, (particularly that of *Somersetshire*, extending to 20 miles in length, and 15 in breadth, whose fury had drowned several Towns, and swallowed up many hundreds of men, some making their escape upon deales and pieces of Timber of Houses, that were waht away; Rabbits fled their lodges and got atop Sheeps backs swimming as long as they could for their lives: Corn and straw floated up and down in abundance, being filled with Rats and Mice endeavouring their escape, besides a great number of dead creatures that were seen adrift) *Holland*; many places of *Asia*, *Africa*, &c. Among these none was ever more furious, than the Deluge hapning in the year of the Creation 1656, mentioned in the seventh Chapter of *Genesis*, whose eminence above the Earth reached to 15 Cubits, destroying all living Creatures (except some few only) that had thitherto fed upon the fruits of the ground. I must not forget here to rectifie Peoples judgments perswading themselves that this Inundation should have been universal. I grant it was universal in two respects:

1. To all the Earth that was inhabited by the Patriarchs and their Tribes.

2. In respect to the universal damage and loss; for it had destroyed all that was upon Earth, excepting those that were miraculously preserved for the preservation and use of the race of Man. But pray can any one rationally conceive, that the height of 15 Cubits of water above those hills of *Asia* should have exceeded the tops of all the mountains of the world? What proportion is there between those hills & 15 Cubits, and the Peak of *Teneriffe*, the Mount *Venpi* in *Quetichen*, or *Jekin* in *Chingutu*, or *Kesing*, *Mung*, *Hosang*, *Juntay*, *Loyang*, *Kiming*, (where they are nine daies in getting up to the top) *Funghoan*, being all Mountains of *China* reaching higher than the lower clouds; The *Olympas*, *Athos*, or those high Mountains upon the West-Indian Coasts? No more than there is between a man and a steeple. Or is it probable that forty daies;

daies rain should drown the whole World, when a whole fix months rain falling every Winter upon the *East-Indies* scarce increaseth the intumescence of the Ocean. But observe the scope of the Scripture, *Gen. 7. 18. And the waters prevailed greatly, and were greatly increased upon the earth, &c.* Here the divine Text seemeth to intend nothing further than a great prevailing and increase of the waters, which could effect little more than a partial Inundation; for otherwise to have caused an universal one, none less than the greatest prevailing and increase of waters would have sufficed. Wherefore the words of ver. 19. viz. *And all the Hills, that were under the whole heaven, were covered,* are to be understood only of all the hills, that were covered by the whole heaven described by their Horizon: And still in the popular speech, when we say the whole heaven, we mean no more than the Horizon, that is as far as we can see round about us,

II. Next let us consider the manner of this great Deluge.

1. It was not caused through the irruption of the Ocean into the earth, because then the said Deluge would have been extremely sudden, viz. in six hours time the flood must have brought in the waters, and it must have left a large Gulph, where it brake in: Neither was the Sea high enough to have made such an assault.

2. The beginning of it was taken as the Text holds forth, *v. 11, 12. From the breaking up of the fountains of the great deep, and the opening of the windows of heaven, and the violent rain:* These sudden impetuous tempests must needs have caused a great astonishment and anguish upon those who had so justly deserved. The breaking up of the Fountains were the bursting of the peregrin Elements, contained within the bowels of the earth, especially of water, air and fire out of the great deep, that is the vast Mediterranean Sea, by men of that Age called and accounted the great deep.

The great occasion of this bursting out of the waters were 1. The heavy innixe of earth in the shallows of the Mediterranean pressing the waters underneath from its Center.

2. The air and fire forced through the earth of the said shallows to pass to their own Element.

3. The tearing winds sent down through the opening of the windows of heaven, which piercing the pores of the earth contributed

red not a little to the stirring up of the air and fire contained within the earth, and to the vibration of the terrestrial Mass.

4. The impetuous showers of rain breaking down and dividing the earth.

Through this tempest the waters of the Mediterranean got above the earth, and a great proportion of the tract of air brake into the earth, having so fair an opportunity as at the nick of bursting to get nearer to the Center: But being inclosed by water & separated from its Element was by the potent compression of the said water forced to return, whereby the waters must necessarily be much tumefied, lifted up, and cast out of their mole, whence they were constrained to float over the earth: but the air being most returned, the rain restrained, and the winds directed to pass over the earth, the waters settled and retired into their Cavern leaving the earth very much disposed to germination of plants; and so the stopping up of the Fountains of the deep and the windows of heaven was accomplished.

III. Not many years after there hapned another deluge somewhat less than the former, caused through the bursting up of those waters, that now constitute the *Mare majus* or *Euxian* Sea, and the Lake *Maotis*. Some hundred years after another deluge came upon *Persia* and *Tartary* by the bursting up of the *Hircanian* or *Caspian* Sea. The West-Indians have successively retained in their memory a great Inundation, which they imagine was universal, came upon them through the bursting up of the Lake *Hanegaban*, or *Pirime* in *Guiana*.

Through these before-mentioned deluges a great part of the *Island Cea*, half of the Town *Tyndarida* in *Sicily*, *Acarnania* (being drowned in the Gulph of *Ambracia*) and *Achaia* in the Gulph of *Corinth*, and other great Countries must have been swallowed up and laid even with the bottom of the said waters; as likewise hapned to *Pyræa*, *Antissa*, *Elice*, *Bura*, and many other places: others must have appeared through the thrusting up of that Land, in whose stead the waters succeeded. This occasioned the new appearances of *Delos* and *Rhodus*, of *Nea* situated between *Eëmnus* and the *Hellepont*; of *Abone*, *Thera*, *Therassia*, *Hiera*, and *Anaphe*.

IV. Through the said discontinued and unequal bursting up of the waters and breaking of the land, *Sicily* was separated from *Italy*, *Cyprus* from *Syria*, *Baby* from *Babynia*, *Atlas* and *Macria* from

from *Eubœa*, *Eubœa* from *Bœotia*, *Leucoſta* from the *Sirenian* Promontory, and many other Islands comprehended within the Mediterranean from the Continent: Likewise have many Sea-port Towns in *Europe* been separated from the Continent, as witness many Ships that have run a ground upon their steeples and houses: Thus in the year 1421 many Towns and Villages of *Holland* and *Freeze-land* were swallowed up by the Sea; and the Sea-men to this day are forced to take notice vvhhere such and such of their Towns vvvere drownded, for fear of inhabiting them again.

The vvaters through their pressing vveight do sometimes decline from one place, vvvhich they then leave dry, to another, vvvhether they have moulded a deeper Cavern; by such an occasion vvvere the Islands of *Antiffa* left dry, and so united to the Continent of *Leibos*, *Zephyrius* to *Halicarnassus*, *Ethusa* to *Mindus*, *Dromiscon* and *Perez* to *Miletus*, *Nartheusa* to the *Parthenian* Promontory; *Hybanda*, *Epidaurus*, *Magnesia*, and *Oricon* to the Continent: The same hath arrived to many other places; namely that some part of a shore hath been deserted through the Seas declination, (as hapned to the Country about *Ambracia*, *Ephesus*, the Plain of *Arabia*, and above *Memphis* as far as the *Æthiopian* Mountains, having been all over covered by the Sea) in such a manner, that Ships vvvhich had been cast avvvay upon the sands near to that shore vvvere after some hundreds of years found some miles off from the Sea, deeply covered vvith earth by length of time, cast upon them partly from the adjacent hills by the vvind; and partly by the heaving up of the sand through the seas diurnal Tides. Hence vve may easily knowv, vvvhence that Mast came, that vvvas found vvith a Pulley to it sticking out of the top of one of the steep hills of *Spitsberg* in *Greenland* near vvvhether they usually fish for Whales.

Before I go further I must convince those of their mistake, that state Earthquakes the occasion of the disappearance of some Islands, and appearance of others, formed through the violent and unequal bursting up of earth.

1. Let them take notice that Earthquakes are fresh enough in mens memories in the *West-Indies*, and those great ones too, yet they never, or very seldom have protruded any Islands there; neither is their eruption large enough for to compais such an effect.

2. Earthquakes happen most through the Earths belching up of vvind, that hapned to be inclosed vvithin her belly, but it is impossible

impossible that a wind should drown a Country, or raise an Island: Possibly you may reply, That together with a wind there oft bursteth out a flood of water. I grant it, and what is this else but a Deluge? Thus many Towns and Villages in *Holland* and *Friesland* have been formerly swallowed up by such deluges, as their great Lakes are still testimonies of; and to my apprehension all that Country must necessarily be subjected to such deluges, since it swims upon the water.

Touching Inland Inundations, as that which befell *Friesland* in the year 1218, where near 100000 persons were buried in the water; and that of *Holland* and *Zealand* in the Reign of *Charles* the fifth Emperour of *Germany*, in the year 1531. and several times since, as that of the last year, when a great part of the Country all about *Gorcum* was seized upon by Inland waters. Their causes are to be attributed to torrents streaming down out of the melted snow, as also to the swelling of the Inland waters, through receiving a great quantity of frosty *minima's*, pouring down from the North in a cold Winter.

The River of *Nile* proves yearly extravagant in *Egypt* for two months and ten daies, because being situated very low it is obliged to receive the superfluity of water falling from above out of several great Rivers and Lakes, as the Lakes *Zembre*, *Saflan*, *Nuba*, and the Rivers *Cabella*, *Tagazi*, *Ancona*, *Coror*, and many others, besides the water which it draweth from the hills and other grounds. These Rivers and Lakes do constantly swell every year by reason of the great rains, that fall there at certain times of the year. Besides the heat of the Sun exercising its power very vigorously near the latter end of *May*, doth very much subtilize and rarefie those waters, whereby they are rendred more fluid, penetrating and copious; and lastly the Sun conversing in the northern declination doth impell the Ocean stronger against the Northern shores, whereby the waters are also much increased. Hence it is, that the waters of the *Nile* are so subtil, that they deceive the air in carrying of them up in vapours, viz. because they are so subtilly strained: No wonder then if they prove so healthy. The same causes are applicable to the excessive increase of the Rivers *Ganges*, *Padus*, *Arrius*, *Danow*, *Tiber* and *Athesis*.

CHAP. X.

Of the causes of the before-mentioned properties of Lakes.

1. *Whence the Lake Asphaltites is so strong for sustaining of weighty bodies, and why it breeds no Fish. The cause of qualities contrary to these in other Lakes. The cause of the effects of the Lake Lerna.*
2. *Whence the vertues of the Lake Eaug, of Thrace, Gerasa, the Lake among the Troglodites, Clitorius, Laumond, Vadimon, and Benaco are derived.*
3. *Whence the properties of the Lake Larius, Pilats Pool, and the Lake of Laubach emanate.*

I. **W**HAT the cause of those effects of the Lake *Asphaltites* should be, the name seems to contain, viz. The water glued together by an incrassated air and condensed fire, constituting the body of a certain *Bitumen*, called *Asphaltos*, whence the said Lake doth also derive its name: It is incapable of breeding fish, because through its sulphureous thicknes it suffocates all vitall flames. On the contrary the Lakes *Avernum* (although deep 360 fathom) and that of *Ethiopia* are so much subtilized through the passing of rarefied air, that they are incapable of sustaining the least weight. Touching their pernicious quality to fowl, it must be attributed to the venomous spirits permixt with that rarefied air, infecting the whole Element of air as far as it covers them. The Lake *Lerna* and the other in *Portugal* cause their effects through the permixture of a quantity of crude nitrous bodies, which prove very depressing. That Lake of *Ethiopia* is unctious through the admixture of incrassated air.

II. The Lake *Eaug* in *Ireland* acquires a sideropoetick vertue under water from the imbibition of crude Aluminous juyces, by means of their indurating and constrictive vertue changing wood sticking in the mud into an Iron-like substance; that part which is under water into a stone-like substance, because of the diminution of the said Aluminous Juyces, which through their weight

weight are more copious in the mud; the part of the wood that sticks out of the water remains wood, as being beyond the reach of the said heavy juices. The Lakes of *Thrace* and *Gerasa* prove pernicious through admixture of crude arsenical exhalations. The Lake among the *Troglodites* being Mercurial is infestuous to the brain. The Lake *Clitorius* through its nitrosity disturbs the stomach, and attracts a great quantity of moisture to it, and infecting it with an offensive quality, causes a loathing of all Liquors. The sudden tempests befalling the Lake *Laumond* and *Vadimon* are caused through winds breaking out of the earth through the water. Lakes resist induration by frost through igneous exhalations pervading them. The Lake *Benacus* shews its fury, when its internal winds are excited by external ones, causing a Concussion and a Rage in the water, like unto an aguish body, which is disposed to a shaking fit by every sharp wind raising the sharp winds within.

III. The River *Abda* passeth freely through the Lake *Larius* without any commotion of its body, because the waters of the Lake through their extream crassitude are depressed downwards, and so are constituted atop in a rigid posture, whereas the River is impelled forwards, and very little downwards: But were it to flow through a shallow water, whose quantity doth not bear any proportion to receive the pressure of the air downwards against the earth, they would soon communicate in streams.

2. The waters of a Lake differ much in crassitude and density from those of a River, and therefore do exclude its streams.

The Lake *Haneyaban* doth not visibly disburden it self of those waters, but thrusting Caverns underneath into the earth, raises all those hills through the intumescence of the said waters, that are near to her, out of which some Rivers do take their rise.

Pilats Pool is stirred into a vehement fermentation by flinging any pressing body into it; because thereby those heterogeneous mineral juices (*viz.* *Vitriolat* and Sulphureous substances) are raised, mixt together, and brought to a fermentation and working: Through this fermentation the water swells and exceeds its borders; but the water being clarified the commotion ceaseth. Neither needs any one wonder, that so small a matter should be the cause of so great an exaltation, since one part of the water doth stir up the other, and so successively the whole pool comes to be stirred.

Pools owe their rise to great rains or torrents, which sometime do flow visibly over the meadows, or through Rivers causing inundations: Sometimes through Caverns of the Earth, as that near *Laubach*.

CHAP. XI.

Of the rise of Fountains, Rivers and Hills.

1. *That Fountains are not supplied by rain.*
2. *Aristotles opinion touching the rise of Fountains examined.*
3. *The Authors assertion concerning the rise of Fountains. The rise of many principal Fountains of the world.*
4. *Why Holland is not mountainous.*
5. *That the first deluge was not the cause of Hills.*
6. *Whence that great quantity of water contained within the bowels of the Earth is derived.*
7. *Whence it is that most shores are Mountainous. Why the Island Ferro is not irrigated with any Rivers. Why the earth is depressed under the torrid Zone, and elevated towards the polars. The cause of the multitude of Hills in some Countries and scarcity in others.*
8. *How it is possible for the Sea to penetrate into the bowels of the earth.*

I. **T**He opinion of Fountains, scattering out of the earth and supplied by waters rained down and collected within Caverns of the earth, as it hath vulgarly taken place among many, so it is very suspicious; experience tells us, that many perennial Fountains spring forth out of sandy and every where about dry Mountains, whereunto notwithstanding but little is contributed by the moisture of the heavens, since the rain falleth but seldom, (as in *Egypt*, and other places,) and the Sun is very hot, the Country very dry, insomuch that did the rain fall in twice that quantity, it would scarce be sufficient to irrigate the soile, much less of supplying moisture for Fountains.

2. Many Fountains draw their water very deep, near a hundred foot, yea two or three hundred deep out of the earth: Whereas rain seldom penetrates deeper into the earth than ten or eleven foot.

3. Some Fountains break forth out of Rocky Mountains, which are incapable of imbibing rain: *Ergo* their rise and continuation are not from rain.

II. The opinion of *Aristotle* is much more absurd, asserting subterraneous air converted into water to be the cause of Springs, since we have formerly made it appear, that the conversion of air into water is impossible; or were it not, it would seem very irrational to suppose the earth to be so hollow as to be capable of containing such an infinite quantity of air, as to continue the course of a Fountain; because a great quantity of air condensed (as they call it) would produce but little more than a drop *.

III. 1. In brief Fountains owe their beginning and continuation to great quantities of water collected within great Caverns of the earth. This the diggers of Mines confirm to us, who sometime through digging too deep meet with great and sudden burstings out of waters, which oft do prove perennial. Such mischances have hapned not once in the Coal-pits near *Newcastle*, to the drowning of many a man. Moreover there are no great hills, but which rest upon great gulphs of water underneath them, insomuch that a hill is nothing else but the raising of the earth through a great gulph of water lodging underneath it. Hence it is that hills are generally the store-houses of Rivers, and their sides or tops their Springs. How many floods of water are there discovered to break out of the sides of several great hills in *Kent*, *Surrey*, and innumerable other places of the world? Whence should those pregnant Pewter Mines in *Cornwal*, or Lead Mines in *Derbshire*, and all other Mines in the world be supplied with a sufficient quantity of water for their matter, were it not that the hills afforded it out of their Caverns? Whereout should all those vast stony and rocky Mountains of the Universe consist, but out of water derived from the Earths bowels? Whence should those great perennial Rivers, that spout forth from under the *Alpes* and *Peruvian* Mountains take their rise, but from those gulphs of water, whereby they are raised to that height? Whence should all the water of those great Lakes upon hills arrive? As that between the middle of the three tops of the hills

* For one drop of water in an *Æolipile* is attenuated into a great blast of wind or air as the vulgar may call it: *Ergo*, &c.

hill *Taihu* in *China*, whose depth was never yet fathomed ; and that upon the Mount *Tenkin* near the City *So*, being of no less depth, and near a quarter of a Mile in compass ; likewise that of *Tienchi* near *Mien* ; that deep Lake upon the Mount *Tienlu* called the Lake of the Drake, because it is so horrible through its depth and commotion, that if any should cast a stone into it, it would render a great noise like unto a thunder : besides many others in *Europe* ; as those in *Ireland*, &c.

In fine, do not all the greatest Rivers of the world, viz. *Ganges*, *Nilus*, *Senaga*, *Nuba*, *Tana*, *Nieper*, *Morava*, *Garunna*, *Thames*, &c. yea, and all others spout out of hills, or are they not derived from Lakes ? Lakes usually are environned by a Plain, because those waters, which should thrust up hills about them are collected in an open Cavern. Notwithstanding are the same waters of Lakes through the air's pressure forced underneath into the earth, where at some distance they do cast up hills, for to disburden the earth, whereat they spout out Rivers ; for a Lake is incapable of it self to spout out a River, because being situated low wants force to spout it out from it, whereas waters, that are protruded and continually impacted and crushed very thick or close into Caverns of hills, do by a renitency press against the earth above and below, and swallow up the air contained within the said Caverns into their substance, and the earth doth reciprocally press against them ; but the air being thin, smooth and glib, is at last violently protruded by both their gravities, which erupting with a great force and discontinuation of the earth, doth make way upwards for the water to be pressed out the easier by the earth with such a force, as may square to the protruding of a long River : Wherefore it is necessary, that Rivers should derive either immediately or mediately from hills : Thus immediately the *Rhein* springs forth out of the Mount *Adula* alias *Vogel* ; The *Danow* out of a Mount within the black wood some 6 Leagues off from *Tubingen* ; The *Necker* out of another near the same Town ; The *Garona* out of one of the Perinean Mountains ; The *Jaxartes* out of the *Sogdian* Mountains, as *Ptolomy* names them ; The *Dnieper* out of some Mountains near *Dnieperco* ; The River of *Jordan* out of two Issues of the Mount *Lebanon*, viz. *for* and *Dan*, both which meeting communicate in one name of *Jordan* ; The River *Euphrates* out of the Mount standing in the midst of the Garden of *Eden* ; The *Bætis* in *Spain*, out of the Mount *Orespeda*
near

near *Castao*; The *Anien* out of the Mountains among the *Trebani*; the *Zepusum* out of some Mountain in *Poland*; and so a million of others. Mediatly, The River of *Nile* descends out of some Hills, that draw their water out of the Lake *Zembre*. The River *Niger* falls vigorously out of some hills near the Lake *Borno*, whose Caverns are filled the length of threescore Leagues under ground by streams flowing out of a Lake between *Guidan* and *Vangue*: The River *Nuba* out of Mountains deriving their water from the Lake *Nuba*, and in like manner many others. Touching narrow short Rivers, that flow from their head downwards to a low place, they may draw their rise immediately from a Lake, because they need not that vigour of impulse.

IV. *Holland* and *Zealand* although very rich in water, yet are poor in Mountains, because their ground is so much thorow soakt and masht with water, that being changed into a mud, it would sooner break into crums, than be raised up into hills. Wherefore the name of *Holland* was very aptly imposed upon that Countrey, since that underneath it is hollow, filled up only with water, the ground swimming atop it in the forme of clay or mud, they having little or no sandy ground within their dikes or bankes.

Hence it appears, that towards the constitution of a Hill these conditions must be required.

1. A great quantity of water must be bored underneath the Earth; for a small quantity would prove invalid to lift it up.

2. They must form their Cavern very deep; for near the Surface they would sooner break through than raise the earth.

3. The ground under which they bore must be very dense, dry and sandy for to keep in the water; for were it moist or loose, it would not rise, but sooner break. Besides, this density and sandiness of the earth doth serve to concentrate and conglomere the earth into one body, whereby it is gradually raised and lifted up. From this discourse observe, why hills are sandy and dry, although containing such a bulk of water underneath them; viz. because of the closeness or density of the *minima's* or sands of the earth compelling the water under them.

2. The reason why all hills do not emit fountains of water, is because the water is lodged very deep under them, or because of the extreme density of their terrestrial *minima's*.

V. This cannot but confute that improbable opinion, asserting hills

hills to be formed through the violence of the waters after the Deluge, carrying great pieces of the earth along with them in returning to their receptacle : another reason against this is, because great torrents, tumbling down with a tempestuous fury, and causing an Inundation or Deluge wherever they touch, scarce leave any sign of inequality of the earth behind them.

2. Here may then be demanded from them, how and whence those hills before or after the Deluge of *Noah*, or of *Ogyges*, or *Deucalion* (it is the same) received their formation ? Hills there were before ; for besides the Bible, *Iosephus*, *Abydenus*, *Berosus* and others make mention of a very high hill in *Armenia major* called *Barin*, by others *Chardaus*, whereupon a pious man should have saved himself in an Ark. So *Ovid* speaks of the Mount *Parnassus*, whose height should have preserved *Deucalion* with his wife *Pyrrha* from the rage of the Deluge. Others to save the matter have conceited the Stars to have attracted lumps out of the earth, and so raised them into hills ; but this opinion is so absurd, that it needs no confutation. The Vulgar observing most hills to be sandy do beyond all reproof believe, that they are nothing else but congections of sand or earth, heaped up by the winds. I shall not think it much to insert their judgment touching a very high hill in *Holland* situated a mile off from the *Hague* towards *Shiveling*, and *zart' e'xonne* called the *High Clift*, which about a hundred years ago, they say was of that height that one might have washed his hand in the clouds upon the top of it, but now is diminished to one third, to what it was, and I my self can remember that it was much higher than now it is. The cause of this diminution they ascribe to the winds, blowing down the sands, out of which they say all those small hills, that are about it, were formed. But to rectifie their apprehensions ; who can rationally judge, that winds are forcible enough to remove hills of that weight and bigness, or that winds should be strong enough to heap up such a Mountain ? Any one would sooner imagine the winds to blow them down : If then winds have not the power to raise a Mountain, certainly they are too weak to pull one down. Or thus, If winds be so powerful, why did they not blow down such hills before they came to that height ?

2. Hills in many Islands of the *West-Indies* are raised much higher, where the winds are much more outrageous : Wherefore the cause of the diminution of the fore-mentioned *High Clift* must be

be adscribed to the removal of the water underneath (whereby the hill doth gradually sink and grow lesser,) and boring further into several places about hath raised those other hills.

VI. But since hills are so numerous, Lakes and Rivers not scarce, a disquisition must be made, whence and how such a vast quantity of water doth redound within the bowels of the earth.

The peregrin Element of water within the earth bears no proportion of affording a competent moisture towards the casting up of so many monstrous Mountains, or scattering such large perennial Fountains and Rivers, or of depressing the Surface of the earth by such vast Lakes: Wherefore I say nothing appears full enough to effuse such dimensions of water but the Ocean alone, whose belly being oppressed with an inexhaustible plenitude is constantly irritated to vomit up its superfluities into the weaker and lower parts of the earth. Reason will incline us to this truth: that must be the original of waters, whereinto they are disburdened (for otherwise if the Sea did retain all those waters evacuated by Rivers, it would manifestly increase, but since it doth not, it is an argument that the Sea expels as much as it receives;) but that is the Ocean, *Ergo*.

2. Many Lakes, Fountains and Rivers, although remote from the lips of the Sea, do notwithstanding participate of the flowing and ebbing thereof, as that Fountain in the Island *Gades*, another near *Burdeaux*, &c. *ergo* the sea doth press water thither.

3. The divine words of *Solomon* confirm the same to us, *Eccles. 1. 7. Unto the Place from whence the Rivers come, thither do they return again*, but that is into the Sea, *Ergo*.

4. The ancient Church-men do also subscribe to this, *viz. Isidor, lib. 3. de Orig. Cap. 20. Basil. Hom. 4. Hex. Jerom upon Eccles. 1. Damasc. lib. 2. de fid. orth. c. 9. Hugo de S. Vict. upon Gen. Dionys. upon Prov. 8. &c.*

The manner of the Seas conveyance or passage to the innermost parts of the earth is by screwing, pressing, and penetrating through the lowermost parts; for there the Sea is most potent, exercising its weight refracted to the sides, whereas atop it is too weak, of were it strong enough, it would break forth before it had passed any considerable way. Besides its own weight the saltness of the Sea doth very much conduce to the intending of its force; for these saline particles are apt to undergo a dividing and cutting pressure.

VII. Places, that are bordering upon the Sea, are alwaies and

every where cast up into high hills or mountains, because they receive the first impulse of the Sea waters pressing underneath; Hence it is, that every where about, the Coasts are encompassed by hills. Mountains are oft higher and greater within the Land than near the Sea, because they are raised by the meeting of great quantities of water impelled from two Seas; So the *Alpes* are cast up by the water impelled from the Venetian Gulph of the one side, and the *Tyrrhenian* Sea of the other, both meeting under them. The Peak of *Teneriffa* is thrust up to the height of three-score miles through casting up all that ground, into whose room a great depth of water is succeeded undermining it all about. The Island *Ferro* is not irrigated atop with any fluent moisture, as Lake, River, or Springs (except only with the abundant droppings of a tree drawing moisture from a great depth, or by collecting the dew of the air, which sufficeth to quench the thirst of all the Inhabitants and their Cattel;) because consisting throughout of high Mountains, their sand lying very close deep and heavy, doth detain the water underneath them.

The earth is much more depressed under the torrid Zone, and as much more raised towards the Poles, because the Ocean being gathered into a vast body under the forementioned Zone depresseth all the land under it and near to it with one collected and united force of weight towards the Poles, which doth undoubtedly assure me that under both Poles *Artick* and *Antartick* the firm land doth stick out far above the waters: And questionless *Greenland* is projected quite throughout the Northern polar Region.

The Mountain *Serra Leona* in *Ethiopia* bearing up to the height of the clouds (wherewith the top is always beset,) although raised within the torrid Zone, is suffulted by a great gulph collected through the meeting of two or more parts of the Sea under ground; And whole *Africa* seems to be inflated into high mountains from the limits of *Egypt* until the farthest part of the *Atlantick* mountain through communication of Lakes, which again arise out of the concourse of waters propelled from the *Mediterranean*, *Erethrean*, *Ethiopian*, and *Atlantick* Seas. *Arabia* is likewise lofty through hills vaunting upon waters immitted from the *Persian* and *Arabian* Gulphs.

Moscovia and *Lithuania* are for the greater part Champian Countries, because their soil is too much soaked for to be raised up
isto,

into hills. 2. By reason of the multiplicity of Lakes and Rivers, through which the subterraneous waters are vented.

Sweden, Norway, Scania are very abundantly watered with Lakes and Rivers; the Sea upon those Coasts exceeds in depth the length of Ships Cables; The reason is, because those waters are very much intended in their pressure downwards through the vast number of cold and frosty *minima's* raining down from the North Pole.

VIII. Before I digress from the subject of this Chapter I am only to shew you the possibility of Marin waters their pressure out from the depth of the Ocean into the innermost parts of the earth. This I shall easily accomplish in mentioning, that the force of fresh waters within the land have moulded through the ground the length of many Leagues; if so, the same is much more possible to salt water. The River *Niger* bores through a heavy, dense and deep ground the length of 60 miles, before it evacuates it self into the Lake *Borno*. The River *Nuba* doth likewise force a Cavern many miles long into the earth. The Spaniards vaunt excessively of a long Bridge, whereon ten thousand Goats and Sheep reap their pasture, and is nothing else but the passing of the River *Acas* (*alias Guadiana*) the dimension of 8 or 9 Leagues underground, beginning to disappear near *Medelina*. The *Tigris* runs herself under ground on one side of the mount *Taurus*, and comes up again on the other side, and beyond the Lake *Thorpes* hides it self again within the earth 18 miles further. *Camden* in his *Britannia* makes observation of the River *Mole* in *Surrey* diving under ground near white hill, and appearing again a mile or two thence near *Leisherbed* bridge. Historians tell us that the *Alpheus* floats secretly under ground as far as *Sicily*, where with its appearance makes choice of a new name, *viz. Arethusa*, famous for gulping up of offals, that had been cast into the *Alpheus* at the Olimpick Games usual every fifth year. The *Danow* runs some miles under ground, before it flows into the *Sava*. Upon the top of the mount *Stella* is a certain Lake near 12 Leagues distant from the Sea, which oft vomits up wracks of Ships, that were cast away at Sea.

CHAP. XII.

Of the causes of the effects produced by
Fountains.

1. *Whence some Fountains are deleterious; The cause of the effect of the Fountain Lethe, of Cea, Lyncytis, Arania; The causes of fecundation and of rendring barren of other Fountains; The causes of the properties of the Fountain of the Sun, of the Eleusinian waters, of the Fountains of Illyrium, Epyrus, Cyreniaca, Arcadia, the Holy Cross, Sibaris, Lycos, of the unctious Fountain of Rome, and Jacobs Fountain.*
2. *The causes of the effects of Ipfum and Barnef Wells.*
3. *Whence the virtues of the Spaw waters are derived.*
4. *Of the formal causes of Baths.*

1. **T**HE Fountains of *Thrace, Arcadia, Sarmatia, Armenia, Lydia, and Sicilia* are deleterious through the permixtion of crude arsenical juyces, transpiring out of the earth. The same causes operate the same effects in the Founts of *Wolchenstein, Valentia, Berofus, &c.* The *Lethe* of *Boeotia* owes its effects to crude Mercurial vapours immixt within its substance: Another in the same Countrey produceth a contrary effect through a succinous exhalation. The Fountains of *Cea* and *Susa* differ little in causality from the *Lethe*. The *Lyncytis* inebriates the brain through repletion by sulphurous exhalations. The Fountain of *Arania* makes use of crude nitrous juyces for the accomplishing of its effects. The Fountain, which *Solinus* affirms to conduce to fecundity, must be a thorowly attenuated and well concocted water, like to that of the *Nile*: The other opposite to this in operation must be very Saturnal. A sulphureous Nitre, or a mixture of Sulphur and Nitre into one close juyce, dispersed through the waters of the Fountain of the *Sun* among the *Garamantes*, renders them very cold in the day time, because the Nitre then predominating condenseth and incrassates the waters, the more because its sulphureous parts, which do otherwise rarefie them, are through the *Suns* beams extracted, disunited, and dispersed:

dispersed: Whereas in the night season the sulphureous parts, being united through the condensing cold of the night and condensation of the nitrous particles, turn into an internal flame, causing that fervent heat. The *Eleusian* waters are irritated to a fermentation of heterogeneous mineral juices through the percussion of the air by a sharp musical string, whereby through continuation the waters are likewise percussed and its contents stirred. In the same manner is the next related fountain cast into an exultation through the shrill acute vibrating and penetrating percussion of the air by the lips, whereas the walking about stirring the air but obtusely cannot effect such a penetrative or acute motion. The Fountain of *Illyrium* contains secret Vitriolat sulphureous flames within its substance, whereby it proves so consuming. The Fountains of *Epyrus* and *Cyreniaca* vary in heat, by reason of the greater or lesser dispersing and rarefying, or uniting and condensing of their sulphureous flames. Springs remain cool in the Summer through the rarefaction of their fiery spirits exhaling and passing out of the ground in the Summer; they produce a small warmth through the condensation of their igneous particles in the Winter. That Fountain of *Arcadia* exerciseth such a penetrable concentrating force upon Gold and Silver through the quantity and strength of its nitrous spirits, which are only obtused by a Mules hoof, through the Lentor and obtuseness of its body, and therefore may easily be contained in it. The Fountain of the *Holy Crofs* appears red through the admixture of red bole. The overflowing of Fountains for a certain space depends upon the pressure of a greater quantity of water thither, which in the Summer time may prove more copious through the attenuation of the water and rarefaction of the earth. The reason of their detumescence after their repletion is the waters further impression towards other parts, or repression thither whence they came, through the expiration of the air flatuofities out the mouths of the Fount., whence the earths gravity depresseth them back again. Those that increase and decrease with the course of the Moon, or rather of the Ocean, vary through the change of the universal Tides, of which hath been sufficiently treated above. Touching the Lithopoetick vertue of waters, it is much agreeing with that of the earth, of which above. The *Sibaris* causeth sneezing through its acre and vitriolat spirits. Some waters are apt to change the temperament of the body into a cold or phlegmatick disposition causing;

causing the hair of Cattel to be protruded with a faire colour; others into a cholerick habit, causing the hair to be of a reddish colour. The Fountain *Lycos* is unctious, and therefore serveth to burn in a Lamp. Whether to adscribe the egurgitation of that oyle Spring, discovered near the Incarnation of our Saviour, to the collection of unctious exhalations permitted with water, or to a miracle, both being possible, I leave to the inclination of your belief: But the disclosing of a false swearer (if there be a Fountain of that vertue) is an extraordinary impression of God upon the waters. *Jacobs* Fountain changeth in colour and motion through the fermentation of various heterogeneous bodies contained within it.

II. Wells are distinguished from Fountains, in that the former do oft appear in a plain or valley, as the foot of a hill, & are subject to fill up and after to be dried up again; Neither do they spout out water with a force like unto Fountains. *Ipsam* and *Barnet* Wells operate their effects through a thick *Chalchantous* or *Vitriol* juyce, which through its sulphureous particles irritates the belly to excretion, and through its subtiler spirits to urine. By the way you must not imagine that their admixture is right and true *Vitriol*; for in distillation by the colour of the subsidence it doth appear otherwise: Neither is the taste a perfect *vitriol* taste, or their operation so nauseous as *Vitriol* dissolved in water. Besides those juyces are indisposed to concretion into *Vitriol*, since these are more sulphureous and less digested: Nevertheless they are somewhat like to *Vitriol* in taste, operation, and grayness of colour, as being nearest to green. Although the main effect is adscribed to a *Vitriol* like juyce, it hinders not but that some *Ferrugineous* and *Aluminous* juyces may be commixt with them. *Tunbridge* waters are impregnated with a thin *chalchantous* spirit, wherby they are usually pierced through with the urine, except in some delicate fine bodies, whose bellies partake likewise of their effect.

III. Among the *Span* waters as *Pouhont* and *Savenier* agree in vertue with those of *Tunbridge* so likewise in their causes; And *Geronster* with *Ipsam*. Nevertheless *Hendricus van Heer* doth not forbear, *lib. de Acid. Spadan. cap. 5.* imputing their effects to red Chalck, which he found, together with some Oker and a little *Vitriol*, upon the bottom of the body of the Still after distillation of the waters. I wonder how he guessed those substances so readily, which had nothing in them like to the said bodies but their colour. Besides the

red

red chalk he named the mother of Iron: A wise saying. In effect those subfidences were nothing else but the *caput mortuum* of the forementioned chalcantous juyces, whose subtiler parts being abstracted and exhale left the courser insipid, like to what the *caput mortuum* of Vitriol useth to be. But pray who ever knew red Chalk or Oker to be eccoprotick or diuretick? Particularly he found *Gercufter* to leave dregs, which being cast upon a red hot Iron would not yield to liquefaction; *Ergo* it must be steel he concluded. Neither would his Oker or Chalk have melted presently, because they were deprived of their Sulphur. But will the infusion of Steel purge by stool and urine like those waters? Certainly no. *Ergo* their purgative ingredient must have been a crude chalcantous juyce.

Falkopius beyond him attests to have found Alume, Salt, green Vitriol, Plaister, Marble and chalk in those waters, which they call Physical waters: a meer guess, these partaking in nothing but colour, and scarce that, with the forenamed Minerals. Doubtless nature had never intended them for such bodies.

Touching the commissions of these juyces with the waters, they do immediately mix with them as soon as they are exhale out of the earth, which had they been intended for those pretended kind of Minerals, nature would have lockt them up in a *matrix*.

IV. Baths derive their natures from the actual hidden flames of a thick and dense sulphureous and chalky matter, the proportion of which do cause a greater or lesser ebullition.

The waters of the Rivers descending out of the Alpes breed such congestions under the throat through a permixture of coagulating and inraffating particles, to wit, of nitrous juyces.

Touching the other properties of Rivers we have already treated of them, and therefore judge their repetition needless.

CHAP. XIII.

Of the various Tastes, Smells, Congelation
and Choice of Water.

1. Various tastes of several Lakes, Fountain and River waters.
2. The divers sents of waters.
3. The causes of the said tastes. That the saltness of the Sea is not generated by the broyling heat of the Sun. The Authors opinion.
4. The causes of the sents of Waters.
5. What Ice is, the cause of it, and manner of its generation. Why some Countries are less exposed to frosts than others that are nearer to the Line.
6. The differences of frosts. Why a frost doth usually begin and end with the change of the Moon.
7. The original or vice of frosty minims. Why fresh waters are aptest to be frozen. How it is possible for the Sea to be frozen.
8. What waters are the best and the worst: the reasons of their excellency and badness.

I. **W**ATER besides its own natural taste, of which we have spoken above, is distinguished by the variety of adventitious tastes, viz. some are sharp and sowre, as the *Savenier*, *Tunbridge* waters, and those near *Goping* in *Suevia* and others near *Lyncestus* in *Macedonia*. Others are of a sweet taste as the water of the River *Himera* in *Sicily*; Those of the River *Liparis* have a fat taste. Some waters in the Isles *Andros*, *Naxos*, and *Paphlagonia* do taste like wine.

The waters of the Fountain *Campeius* are bitter, and flowing into the river *Hipanis* in *Pontus* infects it with the same taste. There are other fountains between the *Nile* and the red Sea that agree with the former in taste, likewise those of *Silicia* near *Corycius*. The pit waters of *Galnicens* are acerbous. The salt taste of waters is unknown to none since the Ocean is pregnant enough with it. Some inland Lakes and Fountains are of the same taste, viz. Three in *Sicilia*,

Sicilia, the *Concanican*, *Agrigentian* Lakes, and another near *Gela*. There is another called *Myrinthus* of the same relish between *Lencades* and the *Ambracian* Gulph. The *Taus* in *Phrygia*, *Thopetis* in *Babylonia*, *Asphaltites* in *Judea*, *Sputa* in *Media Atropacia*, *Mantianus* in *Armenia*, one in *Cyprus* near *Citium*, another between *Laodicea* and *Apamia*, two in *Bactria*, another near the Lake *Mæoris*, and that of *Taogan*, *Forrien*, besides many more are all of a saltish taste. Touching Fountains there is one in *Narbone* exceeding the Sea in saltness. There are six more of the same taste near the Adriatick gulph, where it bends towards *Aquileia*; besides several other salt pits in *Italy*, *Illyris*, *Cappadocia*, &c.

II. Waters vary no less in their sent: Some stinking, as the Lake between *Laodicea* and *Apamia*, the Fountain among the *Phalisci*, another near *Leuca* in *Calabria*, and those rivulets near the Lake *Asphaltites*, &c. Others give a sweet sent as the Fountain of *Cabara* in *Mesopotamia*. The Pit *Methone* in *Peloponnesus* smells like a Salve.

III. Next let me make address to the causes of these qualities: A sharp taste is derived from those acute and Vitriolate particles imixt in the water. A sweet taste is produced in water through an exact aerial mixtion or percoction with it. The waters of *Paphlagonia* afford a vinous taste through the admixture of tartareous exhalations, or such as are like to the mixture of Tartar of wine. Bitterness flows from adult terrestrial particles admixt to waters. Aluminous exhalations dispersed through water render it acerbous. The saltness of the Sea and other Inland waters is communicated to them from the admixture of saltish particles exhaling out of the mud. Touching the generation of salt and its mixtion I have inserted my opinion above, I shall here only have a word or two with those that state the Sun the efficient cause of the said saltish particles, broyling and aduring those exhalations contained with the body of the waters; whence they assert the superficial parts of the Sea to be more saltish than the lower parts of it, because the Sun's heat is more vigorous there. If the broyling Sun be the efficient, whence is it then that some Lakes and Fountains are very salt, where the Sun doth not cast its aduring beams?

2. It is very improbable, that so vast a number of saltish particles should be generated in the torrid Zone, (where the Sun doth only broyle) as to infect the waters within the polars, that

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are so remote thence : How then is it, that the waters prove as saltish there, where the cold is as potent as the heat elsewhere, as in *Greenland* ? Or absurdly supposing the Sea to be so far communicative of its flavour, why doth it not obtain a power of changing those sweet waters, which it is constrained to harbour within it self ? As those, which *Columbus* relates to have found in the *American* Sea, near to the road of the Drakes head : Moreover he attests to have sailed through fresh water a hundred and four Leagues far in the North Sea. *Pliny*, lib. 2. c. 103, affirms the same, viz. to have discovered fresh water near *Aradus* in the Mediterranean, and others by the *Chaledonian* Islands. And in lib. 6. c. 17. he reports that *Alexander Magnus* had drank a draught of Sea water that was fresh, and that *Pompey* when he was employed against *Mithridates* should have tasted of the same.

3. The Ocean being alwaies in such an agitation cannot be a fit *matrix* to concrease or unite such mixtures.

4. The broyling Sun doth rather render salt waters, fresh as hath been experienced among Seamen by exposing pails of Sea water upon the deck to the torrid Sun under the Line, which after a while standing do become much fresher. An open heat doubtless sooner dissolves a mixture than it generates one; for boyl Sea-water long upon the fire, and it will grow fresh; or distill it, and you will find the same effect. Beyond all scruple these saltish particles must be united into such mixtures out of earth proportioned to the other Elements in a close place or *matrix* (yet not so close as to concrease them into a fixed subterraneous body or mineral) whose coldness doth adact, impact, and bind the said Elements into an union and mixture, which through defect of an entire closeness do soon exhale or transpire. In a word, the saltness of the Sea is generated within its mud, whose closeness impacts and coagulates the exhalations of the earth into salin particles, whence they are soon disturbed through the motion of the Sea, and the attracting heat of the Sun. Hence it is, that old mud, clay, and such like bodies prove generally saltish, so that the Sun adds little excepting in the stirring up of the said exhalations. And touching the foregoing instance of the waters greater saltness atop than below, it is fictitious; for the Sea is much fuller of salt below than above, because of its weight. Nevertheless the Sea doth taste more saltish atop than below, because the subtiler parts of the Salt are attracted or forced by the heat of the

the Sun towards the top, which meeting there are apt to strike the tongue more piercing than otherwaies. But whence these fresh waters do burst up into the Sea is worth our inquiry: To resolve you, you must know that the earth in many places under water is raised up into hills, or shallows analag to them, whose earth atop lying very close doth hinder the water above it from passing, especially in the Northern Climate, where the Sea is somewhat thicker than under the Line: but is nevertheless bursted through propulsion of the waters underneath, which evacuated into the body of the Sea do cause that extent of fresh water without suffering themselves to be infected with the Saltness of the Sea, because the Sea-water is so thick and close, that it excepts the fresh water from making an irruption into its continuity: Hence it is, that the River of the *Amazons*, besides many others although irrupting into the Sea many Leagues far, yet is maintained impolluted and fresh. But why those salin particles should be generated near to those fresh springs, and not close about them may seem strange: It is because one ground is muddy and disposed to generate salt, the other about the said spring is sandy, dry * (as it were) and close, and not at all masht through as mud is. The Sea-water deposeth its saltness in being percolated through the earth suffering the subtiller parts alone of the waters to pass, but keeping back the grosser and salin ones.

IV. Sents are materiared out of the subtiller parts of the matter effecting tastes; wherefore all waters, that are discernable by tastes, emit their subtiller parts for sents; but of this abundantly before, whither I must direct my Reader.

V. Ice is water congealed, or incrassated, indurated, or rather reduced to its natural state. That which congeales the water or reduces it to its natural state is the absence or expulsion of those Elements, that render it fluid, viz. fire and air. These are expelled by frosty minima's falling down from the Poles, and compressing or squeezing them both out of the body of water, whence it is also that all waters swell through the frost, viz. through their repletion with the said minima's. These are nothing but Unites or points of earth adunited to so many unites of water freed within their body from all air and fire, and derruded from the Polars towards the earth, whither they are vigorously forced down in a very close order into the Surface of the waters; where arriving they press out the air and fire, which being expelled, the super-

* That is underneath somewhat what more from the reach of the water atop.

ficial parts of the water cleave naturally to one another about those frosty *minima's*. The first beginning of a frost is taken from the first decidence of frosty *minima's*, which in their passing cause a vehement compression, and lighting upon our tact make us give them the name of cold (because they compress our external parts with a smart continuous compression;) thence falling upon the water (if in a small quantity only) do thicken it a little, if in a greater do forcibly expel the air and fire, which being expelled a concretion of the water near its Surface must naturally follow. If now it grows no colder, and that these *minima's* fall in no greater quantity, the Ice continues at a stand; but if otherwise, then it proceeds to a greater induration and a larger concretion: And the deeper the waters do thicken, the more acute the cold must be, or the greater quantity of acute and dense *minima's* must follow for to further and continue the said concretion, because unless they are acuter than the former, they will not be minute enough to pass the small porofities remaining in the Surface of the Ice. Ice swimmeth atop the water, as long as it freezeth, not because it is less weighty, (for it is heavier;) but because its continuity and concretion together with the support of the air tending from the ground of the waters towards its own Element do detain it. When it thawes the Ice sinks down, because it is somewhat discontinued and melted, and by reason of the same proportion of air descending and bearing down upon it, that was ascended before. Notwithstanding the thaw people do oft complain of a great cold two or three daies after, and especially in their feet, which is nothing else but the same frosty *minima's* repassing out of the earth and water towards the Element of air for to give way to the melting entring air and fire.

The frosty *minima's* that begin to fall with a red Evening sky denoting the clearness of the air and passage, do oft bring a furious cold with them, because finding no obstruction they fall very densely and acutely upon us; but those, that fall through a cloudy air seldom cause violent colds, because they are partly detained by the same clouds: Hence it is, that most Countries, that are beset with water (as Islands, peninsuls, &c.) and thence attain to a nebulous air, are warmer, than other Countries although the former be remoter from the Ecliptick than these, because their clouds obstruct and detain a part of the frosty *minima's*, and break the rest in their motion downwards: Whence it is also that England is less cold in the

the Winter than most parts of *France* or *Germany*, although both are of a less Northern declination than it. The same clouds do likewise in the Summer break the violence of the fiery *minima's* descending, whence it is also less hot here than in the forementioned places, no wonder then, if Geographers do so much ex.oll this Island for the temperature of its Climate.

V1. This language is supplied with a very apt distinction of frosts, viz. a *black frost*, a *gray*, and a *white frost*.

The first of these is felt to be of the greatest fury, insomuch that if it proveh for any time lasting, it deads the roots of young plants and old trees, kills all Vermin, and penetrates through the very *peristium* of Animals, and depth of Rivers. It derives its violence from the exream number of the descending frosty *minima's*, whose density makes the Skies even look black again.

A gray frost is between a black and white one, consisting likewise of a dense proportion of descending *minima's*.

A white frost is the incrassation of vapours in the lowermost region of the air. Among these a black frost is of the least continuance, because the frosty *minima's* tumbling down in such vast quantities are soon purged out of the air.

Here may be inquired, why a frost usually begins and ends with the change of the Moon. For solving of this, you must observe, that the causes of the decidence are,

1. Their great number.
2. Their congregating or congress.

Touching the first, unless their number is proportionable to bore and press * through the clouds and resistance of the air, they are incapable of descension for to cause a congelation: and although their number be great and dispersed, they are nevertheless retained through the over-powering of the clouds: Wherefore it is necessary a great quantity should be united into heaps, and so make their way through.

* Or rather to be bored or pressed through.

To these principal causes add this adjuvant one, viz. The compression of the Moon, she at her changes driving the frosty *minima's* more forcibly towards the Poles, through which impulsion they are withal thrust one upon the other and united into a body, whence it is that they at those times do oft take their beginning of decidence. Again the Moon near the same terms impelling the clouds and thick air thither doth prove as frequent an occasion.

occasion of dispersing those frosty *minima's*, especially if much diminished of their body through preceding decencies. Moreover these frosty *minima's*, although they are sometimes broken & dispersed in their decidence through the said impulses, yet sometimes they do recover a body, and make a new irruption downwards: And thence it is, that oft times a frost holds for a day or two, then thaws for as long, and afterwards returns to freezing again.

* And likewise the air about the Poles irrupting into the water as you may read in the next Chapter.

VII. In the next place I am to set down the original and rise of these frosty *minima's*. You may easily apprehend, that the Sun in the Torrid Zone and somewhat in the temperate one doth daily raise a vast number and quantity of vapours*, (consisting of most water, then air, next fire and earth) which through the diurnal motion of the air, are carried along from East to West. And through daily successions of new vapours they are compelled to detrude their preceding ones towards the Poles, whither they seem most to tend through the disposition of water and earth contained within those vapours, and the greater force of the heavens driving them towards the Poles as the weaker places, (for there motion is least observed,) where being arrived, are by the privative coldness of that Region assisted to free themselves of the fire and air; the water now cleaving to the earth and divided into millions upon millions of *minima's* make up a dense body, whence through the depression of the air they are devolved down to the earth.

Waters, that are least in motion, less fiery and aerial, are most disposed to concretion: Hence fresh waters are aptest to be frozen: Whereas the Sea is seldom reduced to concretion, because of its continual motion expelling the frosty *minima's* as fast as they are received, or precipitating them to the bottom, or by melting their body through the fiery saline and aerial particles contained within it. Notwithstanding is the Sea reduced to concretion in some Climates, viz. within the Polars, where you have the *Oceanus Glacialis* or Icy Ocean, whose Ice is in some places 60 or 80 fathom deep, in others reaching from the bottom of the Sea to the top; insomuch that the tops of many of those Icy mountains stick out as far above the Surface of the liquid Sea, as the same Sea is deep underneath: The properties of that Ice is to be clear and transparent like glass. *Herodotus* doth likewise make mention of the freezing of the *Bosphorus*, so *Beda lib. de natur. rer. c. 9.* writes, that within a daies sail from the *Ille Tyle* towards the North the Sea is frozen.

frozen. *O'ann Magn.* tells us of the *Gashick* Sea being frozen: But this hapneth, because the Sea thereabout may be deprived of its saltness, (yea some assert, that those mountains of Ice are most fresh water concreated) which being precipitated to the bottom through the density of the frosty *minima's* constantly descending like showers under the Pole, the remaining Surface of fresh water is soon congealed. Before I close this Paragraph, I shall only adde the cause of a strange passion befalling the Glacial Sea, where sometimes of a sudden and in a moment a whole mountain of Ice is mel-ed away, causing a dangerous current, subverting or carrying away many a ship, and yet the frost continueth: The cause of this is not the broyling and melting heat of the Sun, for the Sun is never so kind there, but the union of those fiery salin particles, precipitated (as we told you above) by the frosty *minims* down into the mud, whence working or bursting with an united condensed force upwards do occasion such sudden degelitions.

VIII. Lastly, Waters in respect of wholesomeness differ very much in excellency and choice: Spring water, and those of Rivers are commended above others of Pools, Lakes, and Pit waters, because these latter through their standing still contract a muddiness and filth out of the earth, and sometimes noxious particles coagulated out of exhalations transpiring out the said mud; besides that they are disposed to putrefactions through the abundance of peregrin bodies, protruding venomous herbs, and generating Toads, Frogs, Leeches, Snails, Eeles, and other filthy Insects. Snow waters are no less noxious than the former, because of their crudity, nitrosity, and thickness. Waters gathered and kept in a Leaden Cistern through Leaden or Tin spouts are crude and windy, because they descend out of the cold region of the air; Moreover as *Galen* doth well except, they contract a pernicious quality from the Lead. Wherefore Fountain or River waters carry the bell before them all; but which of these two excels the other we must next distinguish. Fountain waters, as they spring out of the mountains, are yet filled with wind and earthy *minima's*, and therefore must yield to River waters, I mean such as are derived from a Fountain: In these the waters through their rapid streams depose those earthy crude and windy bodies, which they brought along with them out of the Fountains Cavern, and are attenuated and clarified through the Sun beams, and lastly depose their dregs into the earth through
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being strained through its dense and clear sands. And among these there is a great difference; those that take their rise from a standing water or a Lake, and flow through a muddy ground are much inferior to many fountain waters. But others, that stream rapidly from a bright fountain and take their course through a pure sandy or gravelly ground, and meet the East Sun, are the best. River waters in hot Countries, where the air is clear, are preferred before others in cold Climats: Hence Rivers of a Continent take place, before those of an Island, because the latter is generally beset with a nubilous air, filling the said waters with mud, and keeping off the rays of the Sun from concocting them: Wherefore River waters in the Southeast parts of *France* are esteemed before any in *England*; those of the Southeast parts of *Spain* before others of the same Continent, where the River *Tago* is much extolled for its wholesomeness of water; In *Persia* the *Choaspis* affords the best waters; In *India* the *Ganges*, &c. The River of *Thames* affords the best water in *England*, but further up towards the *Woodmongers Gallows* & *Oxford*; not about *London* where the ground is muddy, besides that it is infected by the Tides flowing out of the Sea with many saltish particles, dirt, dung, carcases, &c. There must also notice be taken of the rise of a River, viz. That it do not spring out of a Mine; and of the Countries through which it passeth, whether Chalky, Gravelly, or Clayish. In summa waters, that are the lightest, thinnest, clearest and most limpid, of no strong tangle, but of a sweet & pleasing relish, are the best. The weight of waters is known by weighing one with the other in Scales: By letting them run through a small sieve or thick close linnen: their tenuity is known by dropping them upon a Looking-glass, whereof that which drops the least drops and makes the greatest splash is the subtillest; by distillation, boiling, dissolving Salt or Soape in them; by their shaking, smalness, and number of streams; by the swimming of a piece of wood in them, viz. that wherein it swimmeth deepest is the lightest and thinnest, &c.

CHAP. XIV.

Of the commerce of the air with the other Elements.

1. *How the air moves downwards. What motions the Elements would exercise supposing they enjoyed their Center. Why the Air doth not easily toss the terraqueous Globe out of its place. How the Air is capable of two contrary motions.*
2. *That the Air moves continually from East through the South to West, and thence back again to the East through the North.*
3. *An objection against the air's circular motion answered.*
4. *The Poles of the Air.*
5. *The proportion of Air to Fire; its distinction into three profundities.*

1. **A** Ir is a debtor for its name to *aer* in Latine, which again to *ἀέριον*, to lift up, because it was lifted up (as it were) from the *Chaos*. How it was freed from the oppression of the weighty Elements I formerly declared. The remainder is to treat briefly of its commerce with the neighbouring Elements, *viz.* with Earth, Water, and Fire. Daily observations make appear to us, that a cavity is no sooner ready to open within the Earth or Water, but the Air is as ready to strive to enter, not only for to fill up that vacuity, but out of an eagerness, strife, and necessity for to gain a Center for its whole body: For how can any body enjoy rest without being sustained by a foundation? That, which is alone apt for such a work, is the Center, which is a Basis, upon which all its parts do rest. I prove it: The parts of a body being met about the Center, cannot use any force or violence against one another, because they are of one nature, and therefore agree in the same effect: Which is of resting about a Center. Hence it is, That the air (besides its own interest being streightned atrop through the fires inclination also for to recover its Center) doth so much infect, pierce, attenuate, and divide all bodies, that lye in the way to its Center; and that so vast a proportion of air is entered into the body of

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water, as from a solidity to reduce it to a perfect fluor: And although the body of air (as I have stated before) is of that softness, yet through succession of its parts and want of vacuities, whereinto to convey it self, it cannot yield to any compression into it self, but being successively back by its own parts and those of fire, is capable of working the same effects, which the hardest body can. But now supposing the air to have accomplish'd its aime, let us inquire what motion it would then exercise? Certainly of it self no other but its continuous lightness, whereby it would maintain its parts diffused from its own center into the greatest tenuity imaginable. Likewise the other Elements would exercise no other action, but the maintenance of their bodies in the greatest density, crassitude, or rarity, and that through the use of their formal contiguous weight, continuous weight, & contiguous levity; and as the earth through her concentration would not leave the Circumference, although tending hence thither; so neither would the light Elements desert their Center although moving thence thither. Wherefore let me advertize you in time not to mistake my former definitions of Levity, or Gravity, implying the former to move from its Center to the Circumference; that to move here from the Center is not to leave it, but to move thence as from a *Basis*: But now the air being disposed of its genuine Center is forced to make use of a violent Center, situated about the extreame parts of the earth and water, and thence its parts do take their original to the circumference, not leaving their force in the mean while of pressing violently downwards. Here may be inquired, why the air, seeming so far powerful above the earth and water (both in extent of compass and energy or activity of parts) that its extreame subtilty should seem more than potent enough to pervade & dispossess that small clor of water and earth, doth not become victorious. I resolve you; The energy of the air is much refracted through having its Center (upon which all its strength doth consist) divided into that dimension, which the Circumference of earth and water do make; or otherwise it would soon toss that small football out of its place, and make no more of it than the Heavens may seem to do of the Moon. So fire, although a great part is flaming and burning, hath not the power of invading the earth (as many do imagine it would do, were the Heavens all a burning fire) because it is much more refracted in its Center through the Surface of the air: Do we not see that a Durgain is
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able to wrastle with a great Giant, because his low stature doth put him in a capacity of taking the other about the middle, where he easily lifts him from his *Basis* or Center. But possibly it may seem strange to you, that the air should exercise two contrary motions, one upwards, and another downwards. 2. You may likewise demand, how fire can apply any force to earth or water, since it is extended into its greatest rarity, and possesses a place full large enough to contain its body, and consequently is not violently detained. To the first I answer, That naturally a thing cannot obtain two contrary motions, but violently it may. As to the second, This violence is caused here below.

1. Through the incrassation of the air, that is, water ascending and mingling with the body of air doth force so much of it to strive for another place, as it hath taken up of the air, which since it cannot procure upwards is forced to effect downwards upon the earth and water, and make a violent irruption upon them.

2. The air being essentially thin in the second Region as well as it is above, must of necessity press down upon the incrassated air, because all its parts being to take their suffulsion and *Basis* from somewhere, (which it doth from the higher extremity of the air) and not proving strong enough to sustain such a force must necessarily depress into the water and earth, where neither of these finding themselves strong enough about their surface, do necessarily yield and give way to the air pressing downwards for a *Basis*. The same contrary motion is apparent in a man, who is to lift some weight from the ground upwards: First he must move all his strength towards his feet, which is the Center, whereupon this weight must be sustained and lifted up from; then doth he reflect all his strength upon that Basis upwards, where we observe his center to make a hole into the earth, because it is not firm enough to sustain his pressure; even so it is with the twofold motion of air, which you may easily apply to this in every particular.

II. The air innix being shoved off or refracted through the repercussion of the weighty Elements chooses to turn round, that is to bear to the sides, rather than to retort into it self: And that which irritates this with no obtuse spur is the fire, forcing circularly upon the air.

2. The universal waters flowing from East to West is no small cause of directing of the air's motion towards the same aine, be-

cause the air reflecting against the waters flowing from underneath must needs be shoved off thither whither the water flows: I prove it; cast a ball from the shore upon a piece of Timber, driving down a rapid River, its refracted motion will tend towards the drift of the said River.

3. The fire moving from East to West, and forcing upon the air must beyond all scruple prescribe the air a road in its motion.

In the next place I prove that the air is agitated in a circular motion.

1. If waters that are thick are impelled to a circular motion, much more air, whose fluidity and coherence is much more disposed to a circular motion.

2. Fire is a contiguous body, but that moves circularly; *ergo* air much more, because it is continuous. 3. The uppermost clouds are always observed to move circularly, *ergo* the air, that doth contain them.

4. Comets (whereof some are seated near to the extremity of the supream Region of the air) do move circularly, *ergo* the air must also move circularly.

III. Against the airs circular motion may be objected, that the clouds swimming in the air like a ship in the water, are carried about with the air; but the said clouds do move variously, sometimes Eastward, Southward, or Northward, &c. *Ergo* the air is also various in its motions. I answer,

1. That the clouds only near the Polars are various in their motion, which variety is only befalling the inferiour clouds. Herein it bears a resemblance to the motion of water near the Polars varying (although but accidentally) from the course of the Ocean. Besides that there is a difference in motion between the superiour middle and inferiour clouds is manifest by the Moons light about her quarters, disclosing the inferiour clouds to move one way and those above another way.

2. The clouds do oft stream against the tide of the air, as you shall read by and by.

3. The clouds in the torrid Zone, namely the superiour ones, are very uniform in their motion, constantly floating from East to West.

IV. The air taking its beginning of circular motion underneath about the Center, the Globe constituted by the weighty Elements must needs be thought to be its Axletree whereupon it moves: Its

Poles

Poles must be corresponding to the North and South extremities of the said Globe, which together with the Axis are doubtless immoveable, and consequently must only be apprehended in the earth, because that alone is immoveable. Here observe, that the air in the torrid Zone moves swiftest, because it is equidistant from its Poles, and hath the most space to accomplish: Where it is near the Poles its motion is of the least vigour, and nearest seems to be immoveable.

V. The proportion of the Element of air to the Element of fire is the same as water is to earth: Because air is the same in its respective nature comparatively to fire, that water is to earth; for as water is a continuous heavy body immediately superadded to earth, being of a contiguous weight, so is air a continuous light substance annexed to fire being of a contiguous levity; wherefore then the same reason infers air to have the same proportion to fire, that water hath to earth. Hence we must conclude that the profundity of the tract of air is much larger than it is stated by vulgar Astronomists, and the profundity of fire much less than it is computed by the same phantasticks; Otherwise it would seem an impropotion and disorder in the Elements, not to be supposed. The profundity of the air we may aptly distinguish into three equal Sections or Regions.

1. The first or supream is constituted by air most infested by fire.

2. The middle Region is, where the air is lightest and thinnest, and enjoys its greater purity.

3. The third Region comprehends those thick visible clouds.

I will begin with the description of the first Region: As far as the uppermost Region of water is attenuated by the air, so far (considering the diversity of proportion) is the air also rarefied by fire; and as the air doth press down to the bottom of the waters, even so doth the fire in it strive for the Center to the extream depth of air, but is much more in proportion in the supream Region. The middle Region is purest in her own parts because of the equidistance from her neighbouring Elements, but is nevertheless somewhat nubilous. The lower Region is as much incrassated with clouds or vapours concreated, and reduced from its extream tenuity, as the waters are attenuated and reduced from their extream crassitude to that degree of Attenuation through air; Because those parts of water, whose places are replenisht with others of air, must

must recede into the air for to place themselves somewhere.

Against this discourse *Nonius lib. de crep. Alhazen. lib. 3. perspect. Vitell. li. 10. Pr. 60.* and others may seem to set themselves, as appears by their demonstrations although obscure enough, inferring the tract of air not to exceed 25 Leagues in profundity, because Comets being generated in the air, and keeping their station there, do seldom or never clime up higher. But on the contrary, will they assert the *Macula* or spots of the Moon, (which doubtless are aerial and near to the supream region of the air,) and other clouds that seem not to be far distant from the Moon, to be no higher than 25 Leagues? An absurdity. Neither are Comets so near, some appearing but little lower than the Moon, some higher, others in the same degree of Altitude; so that Comets if any while durable are not seated in the air, but in the Region of fire, because they move from East to West with the same swiftness that other lucid bodies do, that are contained in the fiery Region.

CHAP. XV.

Of the production of Clouds.

1. *What a cloud is, how generated, its difference. How a Rainbow is produced. Whether there appeared any Rainbows before the Flood.*
2. *The generation of Rain.*
3. *How Snow and Hail are engendred.*
4. *The manner of generation of Winds.*
5. *The difference of winds. Of Monzones, Provincial winds, general winds, &c. Of the kinds of storms and their causes. What a mist and a dew are.*

I. **N**ubes a cloud is derived from *vépos*, and that from *vén* to swim, because a cloud seems to swim in the air. A Cloud is an aerial body engendred out of air incrassated by water, and somewhat condensed by earth.

Its kinds are very various differing in mixture, magnitude, equality, colour, situation, and motion. Some appear disrupted, discontinued; others intire, uniform; Some are great, others small; some

Some even, flat, hollow, unequal; others are black, red, blew, brown, luminous, dark; others of various colours reflecting Rainbows; Some are situated in the North, South, &c. Others move uniformly, difformly, swift, slow, Eastward, Westward, &c.

Their generation is thus; the air and fire irrupting incessantly into the earth and water are after their arrival thither shut in and cut off from their bodies, and being violently compressed from all sides, are forced by the over-powring of the weighty Elements to return to their former region, whereunto they after some contention do yield, yet not without carrying away a measure of water and earth, closely adhering to them. These retroceding particles, as they come out, give entrance to other air attempting an irruption with its body, waereby* they are elevated continually untill they are arrived to that part of the Region of the air, where it is least infected with the fiery Element; Here the air finding it self strongest and least oppressed with bodies discontinuating its substance, doth press those heterogeneous bodies together into clouds through its virtue of moving to an union, and not through its coldness, for air of it self where it doth in any wise enjoy its purity is estranged from cold, and is naturally rather inclined to warmth. The reason, why clouds are less apt to concrease where the Sun hath power, is, because the parts of the air there are weakened through the rarefaction and discontinuation by torrid *minima's*. These clouds according to their mixture vary in continuation, *viz.* some are thicker and more concreased than others, which through their greater renix are propelled from the others of a less renixency. Clouds containing much earth, and thence rendred dense, appear black; if they are much expanded, according to their diduction, they refract the light variously, appearing red, white, blew, &c.

*To wit, by the crushing of the air tending downwards.

The clouds through their gradual proportion of renixency being disrupted and sinking gradually under one another, refract the light of the Sun according to their graduall situation, seeming to be illuminated with severall and gradual colours, (whose appearance is called a Rainbow:) *viz.* The lower being more thick and dense than the rest refract the light blackish; that above it, being less dense, brownish; that above this, purple or greenish; the other reddish, yellowish, &c. A Rainbow is not seen by us, unless we be interposed between the Sun and the Clouds reflecting and refracting, that is we must stand on that side of the clouds that is irradiated.

irradiated. In *Thomas's* Island the Moon doth sometimes cause a light kind of a Rainbow after a rain.

Touching the figure of a Rainbow, it is semicircular, because the air is expanded in a circular figure, and moved circularly towards us. Many do make a scruple, whether there ever appeared any Rainbow before the Flood, gathering their ground of doubting from *Gen. 9. 13. I do set my Bow in the cloud, and it shall be for a token of a Covenant between me and the earth.* Hereunto I answer, That these words do not seem to make out any thing else, but that God did assume the Bow for a sign, rather implying that the Heavens had been disposed to the susception of Rainbows from the Creation: For even then were the Heavens filled up with clouds fit for the reflection of such a light.

That a Morning Rainbow doth portend wet, and an Evening one fair weather is vulgarly reported, which nevertheless is very uncertain: For the most part it either doth precede rain or follow it; The reason is, because the forementioned gradual declination and incrassation doth cause a rain. Rain is the decidence of clouds in drops. Clouds although incrassated and condensed, gathered and compressed by the ambient air striving to be freed of them, yet cannot be expelled, and protruded all at once, because their extent is too large, and their circumference obtuse, whence they are unfit to be protruded at once, unless they were most condensed into an acute or cutting Surface; Why they cannot be compressed into a less compass and a greater acuteness is, because of a great quantity of air contained within them. Touching their diruption into drops, it is to be imputed to the external compression of the clouds, squeezing the internal air into particles, which as they burst out do each protrude a drop of rain: Or thus, Suppose the clouds at such times to be puffed up with bubbles of internal air, and the diruption of each bubble to send down a drop of rain.

Oft times with rain a great wind blows down along with it, which is nothing else but the air pent within the said clouds and bursting out of them.

A windiness doth oft hold up the rain, because it shatters and disperses the parts of the said dense clouds, whereby their consistency is broken. Rains are very frequent in the Autumn and the Winter, because the Sun casting its rayes obliquely towards those Countries, where the seasons of the year are manifestly observed, doth

raise

raise a greater abundance of vapours more than it can dissolve or disperse; besides, a great number of clouds are sent from other places, where the Sun doth through its Summer heat raise such a great quantity of vapours, which meeting and being impacted upon one another and etruded cause great rains at those times of the year. The Moon hath also great power in dissolving a cloud into rain, for she sending down and impelling great abundance of dense weighty *minims* doth very much further the descent of drops. Frosty *minims* exercise a strong vertue in stifning the air, whereby it is rendred more firm to contain the clouds, and hinder their precipitation, besides they do also disperse the clouds through their effective crassitude; Whence it is, that it rains so seldom in frosty weather: But as soon as the thaw is begun likely the clouds meet and fall down in a rain; Which if sometimes pouring down in great showers is called a *Nimbus*: if in small drops, but descending close is called an *Imber*. The cause of this difference depends upon the density of the clouds, and the proportion of air pent within them.

Those rainy clouds do sometimes contain a great quantity of earthy *minims*, which meeting, are through a petrifick vertue changed into stones, raining down at the dissolution of the said clouds. Other contents consisting of reddish or whitish exhalations drawn up from the earth may give such a red or white tincture to the clouds, which when dispersed into rain may appear bloody, or milky.

Frog or Fish-spawns have sometimes been attracted up into the air, being inclosed within vapours, where within the *matrix* of a close cloud they have been vivified, and afterwards rained down again.

A *Nebula* is a small thin cloud generated in the lower Region of the air out of thin vapours: The reason, why those vapours ascended no higher, is, because they were concreated in the lower parts of the lower Region of the air, through the force of the air in the night, being rendred potent through the absence of the Suns discontinuating raies.

A mist is the incrassation of vapours contained in the lowermost parts of the air.

The dew is the decidence of drops from subtil vapours concreated through the privative coldness of nocturnal air.

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III. SNOW

III. *Snow* is the decidence of clouds in flocks, whose production depends upon the concrescence of drops by frosty *minima's* and their attenuation through aerial particles, whence they are soft and do reflect the light whitish. It usually falls after a degelation, when the congealed clouds are somewhat loosened. It dissolves or melts through deserting the frosty *minima's*.

Hail is the decidence of drops in hard small quadrangular bodies: Their congelation is also occasioned through the detention of frosty *minima's* within the drops of water: Their hardness is from a less commixture of air, whence the water doth the more enjoy her own crassitude and hardness.

IV. *Wind* is a violent eruption of incrassated air pent within the clouds, puffing, disrupting and taring the Element of air asunder. Hence when it blows hard the vulgar renders it, that there is a taring wind abroad. That it is a puffing and disruption is sensibly perceived, since the aerial Element is divided, and being continuous it is subjected to no other violent separation of parts but to a disruption. If so, that which doth disrupt or puffe up certainly can be no other but a continuous body; Because a contiguous one would pass with a single perforation of parts, as the rain, fire, &c. whereas a disruption and puffing is continuous. What can this disrupting body be? It is not water; for that would be perceived by its weight. *Ergo*, it must be incrassated air.

2. The air puffed is continued unto the earth: For we feel its puffing effects, in that we perceive it to cause a light compression or a puffe upon our faces,

3. That it is oft a disruption of the air, our face and lips do testify, being subjected to be cut and cloven in windy weather.

4. The causality of winds may not be imputed to exhalations, as *Aristotle* and his *Peripateticks* did strangely imagine, because those are never so cohering and continuous as to cause continuous disruptions or puffings throughout a whole Zone. Besides exhalations according to the Philosopher are described to be sulphureous, hot and dry: whereas black cold winds in the Winter and wet winds in *September* are quite opposite, and have no sign of sulphur or heat. Winds according to the forementioned supposition should be most frequent and highest in the torrid Zone, and that when the Sun is in the *Equinox*, which falls out quite contrary.

Lastly,

Lastly, VWho would be so simple as to conceive, that such a vast proportion of exhalations should be excited as to continue wind a whole half year or longer together, as *Monzones*, provincial, and Etesian winds, &c? Neither are winds generated out of vapours, as most do now adaies believe; Because then all winds would be moist, whereas most winds are drying. Neither will the grosse-ness of vapours permit themselves to pass with such a fury, violence and incomprehensible swiftness, *Ergo* nothing but air a little incrassated can quadrate to the subtilty, fierceness, swiftness, and long continuation of winds. The manner of their generation is thus.

In the clouds (being as I said before water incorporated with air) each Element striveth for the Center within them, *viz.* The air by sinking down, and water by pressing downwards: Air having the advantage (if inclosed in a great proportion) through its tenuity recovers the central parts; water unites in continuation all about, the air now being slipt away; but the air without, sinking all about upon the besieging water, especially from above (because the whole Element of air sinks downwards) adds no small force to its pressure, whereby it is enabled to squeeze out the inclosed air (being somewhat incrassated, and thence rendred unlike to the ambient air; for otherwaies they would unite, and so its force would be stayed,) with a violence into the extrinseck air*, through which it raises it to some extent, and afterwards puffs it up further, not unlike to the wind squeezed out of bellows, or a bladder. A Fan raises a wind by puffing the air. An *Eolipile* doth evidently confirm to us the foresaid discourse of generation of winds: I shall first describe it, then subnect the manner of using of it.

An *Eolipile* is a hollow ball made of Brass (or any other matter that may resist the fire) whereinto a little hole is pierced. This laid to the fire and heated is cast into a bowl of water, of which it draws in some part: This done, the hole is to be stopped very close, and the ball afterwards laid to the fire untill it grows hot, then unstop it, and it will emit a durable wind, considering the proportion of the water; for a half quarter of a pint of water will suffice to maintain a wind for an hour long. This instance tells us, that wind is nothing else but air incrassated, or a little water attenuated by much air, squeezed out by the compression of the extrinseck air enaring with the fire through the Pores of the Ball.

*Add here-
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rarefying
beams of
the Sun, in-
tending the
force of the
internal air
towards the
circumfe-
rence, in the
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ner as you
shall read
it to be in-
tended
within the
Earth in
the next
Chapter.

The difference between the eruption of incrassated air detruing rain, and that which causeth winds, is that the former is much thicker than the latter, less in proportion, and more dispersed in particles between the thick and dense clouds; the latter is less incrassated, more in proportion and cohering. Air incrassated and vapours differ in consistency *Secundum magis & minus*.

V. The differences of winds are taken either from their duration and type, whence they are said to continue long or short, to be typical or errattick. The former are again distinguished into Trade winds, Provincial winds, Etesian winds, Land winds, and General winds.

Trade winds or *Monzons* are winds blowing one way for six months together, and another way the other six months. They are called Trade winds, because they serve to carry Ships up to and from the Indian Coasts for to trade, or to make trading voyages, as they are usually termed: They ordinarily meet with them in the Channel of *Mozambique* in the month of *August*, whence they make their voyage to *Goa*, *Cochin* or other places of the *East Indies* in thirty daies; In *March* and *April* the wind begins to serve them to return from the *Indies* to the said Channel.

Provincial winds are such as do particularly perflute a Country, and do not exceed beyond the length of it. Thus the West-North-west wind, according to *Seneca* his relation, *lib. 5. nat. quæst. cap. 17.* is proper to *Calabria*; *Tatagis* to *Pamphylia*, *Atabulus* to *Apulia*, North North-west to *Narbone* in *France*, West North-west to *Athens*, a West wind to this Island for the greater part of the year; an East wind to *Portugal* during the Summer, &c. To these common winds are opposites, such as perflute a whole Zone or Climate at any time of the year.

Annual winds are such, as do return at certain times of the year, and last for a certain term of daies. These are observed to be three.

1. The *Ornihean*, (so called from birds) or *Chelidonian* (from Swallows) or Rose winds are westerly winds, which usually begin to blow (but calmly) at the first appearance of certain birds, as *Storkes* or *Swallows*, or the budding of *Roses*.

2. *Προδρομαί*, or forerunners are North North-west winds blowing for the space of eight daies before the appearance of the *Dog Star*. They are called forerunners, because they precede the *Etesian* winds.

3. The

3. The Etesian or annual winds (derived from *ετος* a year) are North North-west winds blowing forty daies every year, beginning two daies after the appearance of the Dog-Star: They usually rise about three a clock in the day, and are laid again at night.

Land winds are such, as blow from the land at a certain season of the day or night, and are opposite to those that blow from the Sea: They are otherwise by the Portugeses named *Terreinhos*; as those from the Seaward *Viracons*. They meet with both upon the Coasts of *Guiny*, *Congo* and *Coramandel*. General winds are those; that blow one way throughout the greater part of the year; Thus off the *Cape of Good Hope* a Southerly wind is general, and thence Westward towards *Brasil* between 28 and 8 deg. South Lat. a South Southeast and Southeast wind is general. To these you may add the fiery winds, which the Spaniards call *Bochornos*, derived from *Boca de Horno*, i. e. the hot steam of an Oven. Common winds are distinguished into Cardinal and collateral winds.

The former are such as blow from the principal corners of the world, viz. *East*, blowing from the rising of the Equinoctial; *West*, blowing from the going down of the Equator; *North*, erupting from the arctick Pole; and *South*, deriving from the *Meridies*.

The latter are such as erupt from those parts of the Horizon, that are interposed between the four principal corners, their number is 32, viz. Next to East towards the South you have *East and by South*, *East Southeast*, *Southeast and by East*, *Southeast*, *Southeast and by South*, *South Southeast*, *South and by East*: Between South and West are inserted *South & by West*, *South Southwest*, *Southwest and by South*, *Southwest*, *Southwest and by West*, *West Southwest*, *West and by South*. From West to North are accounted *West and by North*, *West Northwest*, *Northwest and by West*, *Northwest*, *Northwest and by North*, *North Northwest*, *North and by West*. Between North and East do blow *North and by East*, *North Northeast*, *Northeast and by North*, *Northeast*, *Northeast and by East*, *East Northeast*, *East and by North*. Among these collaterals the *Northeast*, *Northwest*, *Southeast*, and *Southwest* are termed principal collateral winds.

From their temperature winds are distinguished into cold and dry, as the Northern and Western winds, above all the North Northeast in the Winter; or in warm and moist winds, viz. The Southern and Easterly winds, and beyond the others the South Southeast in the Summer. A west Southwest wind is for the most

part

part moist, damp, rainy, cloudy, and sometimes tempestuous. North Northwest winds are stormy, cold, bringing oft Snow and Hail along with them. A South wind is unwholsome, putrid, pestilential, rainy, hot in the Summer, raising thunder and lightning, and makes a thick cloudy sky. The South Southwest wind in the Summer is temperate and warm, moist, and sometimes a concomitant to thunder. The South Southeast wind is moist and warm.

Touching the wholsomeness of winds, those that are of a warm and dry temperature are the wholsomest and the pleasantest, because they attenuate, clarify, and rarefy the air, disposing it to the ventilation and quickning of our vital and animal spirits. Next to these cold and dry winds are the wholsomest, because they purge and serenate the air, descend from a pure and clear corner, void of all putrid and pestilential vapours. Next, those that are simply cool or warm come into place.

All moist winds are feverish, putrid, and sometimes pestilential, causing catarrhes and rheumes, stirring all the excrementitious humours in the body. Very cold winds are better than the next foregoing, yet do oft cause a constipation of the pores and of the belly: But let us take in the opinion of Hippocrates upon winds, lib. 3. *Apho. 17. Now what concerns the daily winds, the North Northeast ones do render bodies solid and firm, and fit for motion, and well coloured. They sharpen the hearing, but yet they dry the guts, moreover they bite the eyes. And if any one hath been troubled before with a pain in his breast, they make it sharper. But the Southern ones do quite dissolve bodies, and render them moister, besides they occasion dulness of hearing, and heaviness of the head and darkish meagrim, moreover they cause a difficulty of motion both to the eyes and to the whole body, and do moisten the guts.*

VVinds do also vary much in wholsomeness according to the Climates or places which they pass through: For if they are infected with putrid vapours and exhalations arising from dead carcases after a field battel, stinking caves, corrupted pooles, &c. their temperament is soon changed, although blowing from the East or North.

VVinds blow equally or unequally, continuately or interrupted, high, stormy, or a moderate gale, or a small brise.

Some winds rise in the day and are laid again or decrease at night, as the North winds: Others are laid in the day and rise in the

the night, as the South winds. The North winds raig on the Land, the South at Sea. Now concerning their causes.

Trade winds are generated out of eruptions of incrassated air, bursting through even and continued clouds, situated in the middle, or at least the upper part of the inferiour region of the air; for only there clouds are diducted in continuation, out of whose various spouts the winds are continued for six months: viz. Out of the North, North Northeast or Northeast side of the clouds of the South Hemisphere blowing to the North, North Northwest, or Northwest, whilst the Sun is passing through the North from *Aries* to *Libra*; and out of the South, South Southwest, or Southwest side of the clouds of the North Hemisphere, blowing to the South, South Southeast, or Southeast, whilst the Sun is measuring that tract from *Libra* to *Aries* through the South. The cause of the copious elevation of vapours uniting into clouds in the South Hemisphere during the Suns peragrations through the North must be impured to the Suns oblique rayes raising a vast measure of vapours out of the Oriental and Occidental Ocean, which excited are beyond the sphere of the Suns direct rayes, whereby they might otherwise be dissolved.

2. Or because they are most apt to be gathered and concreated in a Region that is privatively cold, through the continuation of the air forcing the vapours more potently together. So likewise the Sun conversing in the Northern declination of the *Ecliptick* occasions ventous clouds in the South Hemisphere through the same efficiency.

Next we shall tell you why, the Sun existing in the North declination of the *Ecliptick*, the winds burst out from the South.

1. Namely, because that side of the clouds, which is obverted to the Sun, is discontinued by the Suns rarefaction, or fiery *minims* demitted from him.

2. Because the air is strongest in its compression from the Polar side, as being less discontinued by the fiery *minims*, and inforced by the cold *minims* from the pole wards. Likewise for the same reason the winds burst out from the North, when the Sun is seated in the opposite Hemisphere.

This is observable in those *Monzons*, that near the *Equinoxes* they blow but little or not at all, because the Sun through its burning rayes, which he spreads, when he is perpendicular over the middle

of the torrid Zone doth so much rarifie the air, that it is rendred unfit for the concretion of clouds: But the further the Sun declines, the more high & strong those winds grow, and are at their strongest, when the Sun is near his remotest declination, because through his greater remoteness the air is aptest for concretion.

2. Those winds blow stronger in the night than in the day: Because the internal air of the clouds is then strongest squeezed and least dispersed through the Suns heat.

3. The *Monzones* that blow from the South blow usually stronger, and somewhat longer than the others, because the Sun being then got into the arctick declination is now obliquely imminent upon the waters, and therefore raises the greater quantity of vapours: Whereas on the other side a greater part of its oblique rayes are taken up by the Land.

4. They are oft intended by the Moons demission of weighty *minima's* upon them.

The common winds are prehended in the temperate and rigid Zones.

The East winds blow, when a cloud opens at its VWest side in the East; the North wind blows, when it is vented at the South side in the North, &c. The winds, if any thing durable must spout out of great long clouds, otherwise they would soon be emptied, besides clouds through the commotion of the air do succeed one another, and are united, when the former is suckt out as it were. Sometimes the vvind seems to come down from over our heads, because a cloud is opened there: More frequently from the *fristor*, because clouds do most usually meet in union thereabout. Sometimes the vvindes blow from the North and South at once, because two clouds in those Regions are a venting. Sometimes besides the continuation of a durable vvind, there breaks out suddenly another vvind upon us by a blast; because there is a cloud breaks out underneath those great ones, that cause the durable vvind.

Provincial vvinds are occasioned through bursting out of those clouds, that surround the respective Provinces. For example, If a Country is apt to be most beset vvith clouds on its North sides, then Northerly vvinds vvill prove its Provincials.

Annual vvinds are caused through the particular aspects of the Sun at such a time of the year, raising vapours towards such a place
or

or corner, and rarefying their clouds at such a side. Winds accidentally and violently are most of them coole and dry, because bursting out with a force, they must necessarily cause a compression upon objected bodies, and through their tenuity must rub off the dampness from the same bodies: Yet some winds prove more particularly very cold and dry, because many earthy *minims*, that are incorporated with the imprisoned air, break forth along with them, causing a strong punctual compression or acute cold: Hence North winds happen to partake so much of coldness, because they are incorporated with many terrestrial *minima's* transmitted from the Polars. North Northeast winds in winter feel very pinching and nipping cold, yea numming, because of the commixture of frosty *minims* with their air. South winds are moist, because their production depends upon clouds transmitted from the *Meridies*, whose body is very damp and waterish; they are hot besides, because they have been smitten with the Suns torrid rayes. These are noxious and pernicious, because through their warm moisture communicated to the ambient air they move, relaxe, swell, and dissolve all the humours of the body, whence there must necessarily arise an exstuation or fermentation of the blood.

By the way let me tell you the reason, why many clouds move against the stream of the air: Because their winds bursting on the contrary side draw them, like fire bursting out of a squib draweth the same after it.

Winds blow equally through their equal eruption, high through their greater union and force directed outward, and being augmented by the violent detention of the ambient cloud. Some winds rise in the night, because the internal breath of their clouds is now united through a privative and positive coldness. Others are intended by the help of the dissolving Sun; for the cloud being too close outwardly, and the inward breath not very strong, needed the rarefaction of the Sun. Hence Northern winds are raised in the day, because the faces of the clouds are objected directly against the heat of the Sun: Whereas South winds are laid in the day, because the Sun rarefying the back parts of their clouds attracts their breath backwards, and disperseth it.

Tempestuous winds are distinguished by five names.

1. *Ecnephias*, (from *ἐκ τῶν νεφῶν*, out of the clouds) or an Oricane, which is a sudden and most impetuous wind bursting out directly

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from

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from above out of the sky, and breaking in upon the Sea and Ships, cause it to rise into mountainous waves, and these oft to be over-fer, if their sails be up; wherefore Mariners in the East* and VVest-Indian Ocean as soon as they spy a small cloud in the heavens seemingly not much bigger than the top of ones hat, take in their Sails immediately, or if at anchor they are forced to cut their Cables and expose themselves to the free waves of the Sea for to prevent foundring. The cause of so sudden a fury is questionless a great quantity of incrassated air, admitted to condensed fire, pent in hard within the stiff clouds, and so setting force against force, the air and condensed fire are forced with one violence to break through the thick clouds, which although strongly striving to keep themselves in continuation, yet at last choose to give way, and to suffer some parts of them to be gathered into a small cloud, whereupon that furious *Aeolus* soon puts the whole Climate into a commotion, scattering withall a spout of hot water, kindled through the great fight, rotting whatever it touches, especially wollen cloaths, and breeding worms.

2. *Turbo, Typhon*, (from *τυω*, to beat) or a violent whirlwind is caused through the same condensed fire and incrassated air violently bursting out of several spouts, whose circular refraction meeting upon the Surface of the water or land, oft carries a Ship sheer out of the water, or any other moveable bodies from the land. I have oft been told of Ships, that have been lifted out of the water and cast upon the shore by such winds as these*, but how true I know not, although it seems probable enough.

* Namely,
off the shore
of Cuba and
Hispaniola.

3. *Præster*, from *πυρ*, I kindle, is a furious wind caused through the violent eruption of exhalations, or a condensed fire kindled within the clouds, and incrassated air, which doth not only ruinate houses and trees, but oft burns them down to the ground, and puts the Sea into a boyling heat.

4. *Exhydria* is a vehement bursting out of wind attended with a great shower of rain and hail. But none of these violent winds prove lasting, because the flatuosity contained within the clouds, erupting in so great a measure, must soon be exhausted, whereas were it evacuated in a less proportion, they must necessarily prove more durable.

Among all the winds none delights more in the greatest and longest furies and storms, than the South South-west in the winter, because

because it derives from the *Meridies*, or torrid Zone, where vapours are drawn up in very great measures, and that constantly, because of the Suns continual torrid beams, and the multitude of waters underneath. It is reported, that in the Northern Countries winds are sometimes so furious, that they cast horse and man down to the ground; and in *Tartary* the winds blow so violently, though in the Summer, that there is no travelling at such times. Likewise about *China* and *Japan* tempests are outrageous beyond belief. *Tercera* one of the *Azores* or Flemish Islands, suffers such violences from winds, that the bars of Iron that are fastned to the houses, although of the thickness of an arm or two, are grinded away to the smallness of wiers, and holes are eaten into the Rocks about the said Island of the bigness of a horse through such tempestuous winds.

5. *Statarian* winds rage commonly every Fryday in the *Indies*, insomuch that Ships are provided with an Anchor more on that day; on the Sunday it groweth calm again.

It will not be amiss to add the cause of the variation of winds perceived by Ships that are in sight of one another, and why the wind at Sea differs oft a point or two from the wind at Land: *viz.* Because the wind bursting out low doth reflect against the tumour of the Sea interjected between the two ships, or against the Promontories and Hills of the Lands reflecting the wind, some larger, others narrower. The Seas grow oft very turbulent and incensed:

1. Through the eruption of winds descending from above and piercing through their body, which they raise into high waves by their swelling, and strife of passing.

2. The said winds do raise other winds and flatuosities within the body of waters, partly out of their own substance, and partly out of their mud. The Sea is much more disposed to disturbances in some places than others: As off the *Cape of Good Hope*, likewise between *China* and *Japan*, where Sea-men oft are forced to pawn their ships and lives to the Ocean.

CHAP. XVI.

Of Earthquakes, together with their Effects,
and some strange instances of them.

1. *What an Earthquake is. The manner of its generation. The Concomitants thereof.*
2. *The kinds and differences of Earthquakes.*
3. *The proof of the generation of Earthquakes.*
4. *Their Effects upon the air.*

I. **S**ince we have lately discoursed upon eruptions of incrassated air out of the clouds, we shall next insert a few words touching the eruption of incrassated air out of the Earth, whose egress causeth that, which we call an *Earthquake*, and is nothing else but the trembling of the earth, ordinarily following or preceding the bursting thereof, through subterraneous winds violently breaking forth. The manner of its production is thus: A proportion of air and water being lodged in a Cavern underground is further attenuated into subterraneous clouds, thence into vapours, and thence into incrassated air through *fiery minims* entring and penetrating through the pores of the Earth, whereupon the earth pressing strongly suffers a disruption, in the same manner, as we see a bottle filled with water being close stoppt and exposed to the fire is broke through the force of incrassated air, or attenuated and rarefied water within. Whence we observe these concomitants to be necessary in an Earthquake. 1. A strange great noise. 2. A trembling of the Earth. 3. A great blast. 4. A spouting out of water. 5. Sometimes an unequal discontinuation and excavation of the Earth. 6. Sometimes a flame.

II. The kinds of Earthquakes are taken,

1. from their effects and manner of motion; some causing a shaking or quaking of the earth, (named by some an *Inclination*, by *Aristotle* a *Tremor*,) through which houses, walls, or other buildings are weakened in their foundation, and thence are occasioned to fall down; thus many Cities of *Asia*, in the fifth year of

Tiberius,

Tiberius, of *Bithynia* near the extream passion of our Saviour; the City *Nysse*, *Bâle*, and particularly *Ferrara* a City in *Italy* were demolished: this last was surprized on *Martins* day in the year 1570, beginning about ten a clock at night with most terrible sounds, as if the City had been battered with great pieces of Ordnance; next a very horrible shaking or trembling followed, raising all the Citizens out of their beds, putting them to their beads, pouring out their prayers thrice louder than ordinary, and forcing them to quit the City and to behold the ruine of their houses in the fields; The Palace of the Duke and other great buildings yielded to this violence; many were frighted out of their lives, others killed through these prodigious accidents, not ceasing before the next day at night. No less were the Citizens of *Constantinople* amazed by those most raging Earthquakes, in nothing less terrible than the former, described by *Agath. lib. 5. de la guerre Gothique*; The strange kinds of noises, sounds, thunder, whistling, howling, cracking, that were then perceived, are incredible. *Campania* in the time of the Consulship of *L. Cornelius* and *Q. Minutius*, was infested with a trembling for many daies together. Many do write of such Earthquakes as these, that lasted a month, a year, some two years, but by fits I suppose. In *Parthia* above two thousand Villages have been demolished by Earthquakes; besides many others in *Sicily* in the 16th year of *Charles* the fifth, in the month of *April*; In *October* of the 18th year of his Reign another hapned near *Puteoli* in *Campania*. Others have been observed only to cause a single elevation or puffing up of the Earth, afterwards sinking down again without the appearance of any other violence, and are by *Aristotle* named *Pulses*. By these the earth and houses upon it have been lifted up to a great height, and sunke down again without the displacing of one single stone: Thus the houses of a Town in *Switzerland* called *Friburg* were twice at several times lifted up in the year 1509, once in the night, the other time in the day. By the same accident some houses about *Burdeaux*, in the year 1545, in the month of *August* were lifted up, and sunke down again into their former places. Others cause a bursting and excavation of the earth, swallowing up its whole Surface where it bursted, with the Houses, Men, and Cattle upon it; as when a part of the Island *Lango* or *Coos* (famous for being the Country of *Hippocrates*) was swallowed up, at which time the Inhabitants were

were not a little amazed by an incredible thunder and fury of its commotion. *Camden* gives a relation of a very stupendious Earthquake, that besel the east part of *Herefordshire* in the year 1575 in *March*, where the earth and a rocky hill (called *Marcley hill*) was removed to a far distance thence with the Trees and all the Sheep that were upon it. Some other Trees were cast out of the ground, whereof many fell flat upon the ground, others hapned to fall into the seams of the Hill, and closed as fast, as if they had taken their first root there. The hole which this eruption made was at least 40 foot wide, and 80 yards long, lasting from Saturday in the Evening untill Munday at noon. Likewise a whole Town was swallowed up in the Islande *Anaria*, another in *Thrace*, one in *Phanicia* beyond *Sidon*, and another in *Eubæa*. Others protrude a great piece of earth and cast it up into a kind of mountain, but a very uneven one, as for instance the mount *Modernus* near the Lake *Avernus*: This sort is called *Egestion*. Some cast forth a flame withall, as hapned in the Mount *Vesuvius*, alias the Mount of *Somma* in *Campania*, and the *Mongibell* in *Sicily*. Earthquakes have sometimes removed two opposite fields and placed them in one anothers room, as those two fields in *Italy* where the *Marrucini* were seated in the Reign of *Nero*. For Rivers to burst out, as the River *Ladon* in *Arcadia* did; and others to be stopt up by earth cast into them by such accidents is very possible. Oft times Earthquakes make way for Deluges, which may be also incident upon the earth at the bottom of the Sea or near to the shore; or may happen to the same places without a deluge, whereby the waters have been swallowed up and Ships left dry upon the shore; as that which hapned in the time of *Theodosius*; or that vvhhen *M. Antonius* and *P. Dolabella* vv ere Consuls, leaving great heaps of fish dry upon the sands. In the Reign of *Emanuel* there vv as a very great Earthquake perceived about *Lisbon*, *Scalabis*, and other Towns of *Portugal*, vv hereby the vv aters of the River *Tajo* vv ere so much diffused, that the bottom appeared dry. There is another kind of Earthquake called *Arietation*, vv hen two subterraneous vv inds vibrate against one another: Sometimes this hapned vv ithout any dammage, there being some earth betveen to hinder their conflict; other times meeting in cavernous places have subverted mountains and all that vv as upon them; as those mountains near *Modena*, vv hich *Pliny*, lib. 2. Cap. 83. relates to have been bursted against one another vv ith a very hideous noise,

noise, subverting many Villages, and swallowing up a number of Cattel; yea whole Countries and Armies have been devoured by these kinds of accidents.

2. From their duration, some lasting a day, a week, a month, &c.

3. From their violence some inferring little or no dammage, others being contented with nothing less than ruine.

4. From the sounds that accompany them, being various; as I have related before.

5. From their places: Some more frequently infesting Islands, others the Continent: Thus *Sicily, Aetaria, Lucara*, the *Moluccas* Islands, *Tyrrus, Eubœa, Phrygia, Caria, Lydia, Italy*, and many Countries in the *West-Indies* have very oft been molested by Earthquakes. Cold Countries, as the Septentrional ones, or others that are very hot, as *Egypt*, are very seldom invaded by them.

6. From their efficient, some being extraordinarily raised by the Almighty out of his wrath for to punish the sons of men for their sins; an instance of this we have in *2 Kings 22*. Likewise that, which hapned about the time of the Passion of Christ, supposed by many, as *Didymus*, and others, to have been universall, and to have shaken the whole Earth; but since Ecclesiastick Historians make no mention of it, none is bound to give credit to the foresaid Supposition: However beyond all dispute it was a very great one, if not the greatest that ever the earth underwent. Neither is *Paulus Oros*, to be thought more authentick, relating *lib. 7. hist. Cap. 32.* an universal Earthquake in the time of *Valentinianus*, since the holy Scripture and Reason do tell us, that the Earth is altogether immoveable.

7. From the consequents, viz. Some after the earths eruptions are followed by vehement winds, emptying out of her; others by hot boyling waters; others again by damps and stinking fens; also by vomiting up of stones, clots of earth and other strange bodies.

8. From their extent, some reaching farther, others nearer: Thus there hapned an Earthquake in the year 1577, on the 18th day of September, that began from *Colmar* in *Switzerland*, and reached as far as *Bern*, being near upon 60 miles distant, &c.

III. Now it is requisite, I should proffer proof for the forementioned causes of Earthquakes.

I prove

1. I prove that they are caused by winds; because they alone are of a capable force to burst out suddenly through the earth.

2. Because winds bursting out of the earth do alwaies precede and consecute Earthquakes; whence we may certainly collect, when waters in Pits and Rivers begin to be turgid and continually raised into a great number of bubbles, that an Earthquake is near at hand, as appeared by the swelling and bubbling of the River *Po* a little before the before alledged Earthquake of *Ferrara*.

2. That these winds are principally raised out of peregrin water collected within a Cavern of the earth is evident by the great spouting out of water, that doth follow the eruption.

3. It is further made evident in a bottle half filled with water and exposed to the fire, which doth also make good to us, that the Sun through its fiery *minims* doth press in a great proportion of air into those subterraneous waters, whereby they are attenuated; whence those waters, that are cast forth presently after the diruption, are also rendred boyling hot; so that Countries remote from the energy of the Sun are seated beyond danger of having winds generated within their bowels; however subterraneous fires may supply the office of the Suns beams in attenuating the waters into winds by impelling air into them, whence it is that near the mount *Hecla* in *Island* concussions and arietations happen frequently.

Earthquakes are disposed to eruption in the night season as much as in the day; because as the erupting force of the internal winds is intended by the Suns rarefaction, so is the compressing vertue of the Earth intensified by the more potent sinking down of the air in the night, being freed from the discontinuating fiery *minims*, and by the decidence of the weighty *minims* inherent in the Air.

The Spring and Autumn are Seasons of the year qualified for the attenuating and rarefying of the peregrin waters, whence also they prove most frequent near those times. Why Hills and hilly Countries are subject to tremors and concussions, and other moist ones, as *Holland* and *Zealand*, less, may easily be understood from our discourse upon the generation of Hills.

IV. That Earthquakes portend Famine, Pestilential Feavers, and other contagious diseases is believed by most Grave Authors, but whence such a putrefaction causing the said distempers should arrive to the air cannot vwell be deduced from their assigning exhalations

exhalations to be the causes of Earthquakes, since they hold them to be hot and dry, being qualities according to the Peripateticks resisting and expelling putrefaction beyond any; wherefore it will be most agreeable to hold with us, that it is derived from those moist damps and vapours, that are the material causes of the disrupting winds.

CHAP. XVII.

Of fiery Meteors in the Air.

1. *Of the generation of a Fools fire, a Licking fire, Helens fire, Pollux and Castor, a Flying Drake, a burning Candle, a perpendicular fire, a skipping Goat, flying sparks, and a burning fl me.*
2. *Of the generation of Thunder, Fulguration and Fulmination, and of their effects. Of a thunder stone.*
3. *Of Comets. Of their production.*

I. **T**Hose vapours, that are elevated into the air, oft contain no small proportion of sulphureous particles within them, which if concreasing through their own positive coldness, and privative coldness of the night, into a low cloud (*Nebula*) in the lowermost parts of the lower Region, do compress those sulphureous particles (otherwise termed exhalations, and distinguish it from vapours, because in these water and air are predominant, in the others condensed fire and incrassated air) towards the Center, where uniting are converted into a flame by extending the incrassated air through their condensed fire. This flame possibly appears like unto a Candle, playing and moving to and fro the air, and thence is also called a *fools fire*, or *Ignis Fatuus*, *sen erraticus*, because it proves sometimes an occasion of leading Travellers that are belated out of their Road; for by their coming near to it the air is propelled, which again protrudes the flame forwards, and so by continuing to follow it, imagining the same to be some Candle in a Town or Vil-

lage, are oft mislaid into a ditch or hole : Or if they go from it, when they are once come near, the light will follow them, because in receding, they make a cavity, which the next succeeding air accurs to fill up. The generation of these lights is more frequent near muddy Pools, Church-yards, and other putrid places, that abound with such sulphureous bodies. The said sulphureous parts, if being of a less density, condensed and united by the dense wool of a mans cloathes, or hair, or the hairs of a Horse or Oxe and the foresaid coldnesses, it takes fire at the forementioned places, but flames so subtilly, that it is uncapable of burning : This sort of Meteor is called an *Ignis lambens*, a licking fire, because it flakes then here then there, like to spirits of Wine flaming. *Helens fire* (*sidus Helena*) so called, because as *Helen* occasioned the ruine of *Greece* and *Asia*, so this kind of flaming fire, adhering to the shrouds or Yards of a Ship, is usually a messenger of the Ships perishing. If this flame appears double, it is distinguished by a double name of *Castor* and *Pollux*, which are generally construed to bring good tidings of fair weather. But these kinds of prognostications are very uncertain : They may precede storms, and may appear without the consequence of tempests : For there is no necessity for either. This generation depends upon exhalations condensed and united between the Ropes and the Masts, or the Yards. A flying Drake (*Draco volans*) is a flame appearing by night in the lowest Region of the air with a broad belly, a small head and tail like unto a Drake : Its matter is the same with the former, differing in quantity alone and figure, so framed through the figure of its containing cloud.

In the upper part of the lower Region of the air are produced,

1. A *falling Star*, representing a Star falling down from the Heavens.

2. A *burning Lance*, expressing the Image of a flaming Lance.

3. A *burning Candle* (*fax*.)

4. A *Perpendicular fire*, or fiery pillar, (*trabs seu ignis perpendicularis, seu pyramis*) representing a flaming beam, or pillar.

5. A *flaming Arrow* (*bolis*.)

6. A *skipping Goat* (*Capra saltans*) is a flame more long than broad, glistering, and flaking about its sides, and variously agitated in the air like the skipping of a Goat.

7. *Flying sparks*, moving through the air like the sparks of a Furnace.

8. *Flamma*

8. *Flamma ardens seu stipula ardetes*, or a great burning fire, suddenly flaming in the air like those fires, that are kindled out of a great heap of straw.

All these depend upon a grosser material cause, being somewhat more condensed and united than the former, through a greater privative coldness, and therefore they are also more durable. A falling Star obtains its production near the permanent clouds, and being somewhat weighty through earthy *minims*, and rarefying the air through its heat breaks through * and falls down lower, untill it is arrived to a thicker cloud, where nevertheless it doth not abide long in its flame. The others procure their figure from their proportion of mixture, and shape of the ambient cloud.

* Or rather is detoured.

II. Thunder is a great rebounding noise in the air, caused through the violent bursting out of inflated air and condensed fire, being suddenly kindled into a flame *; the manner & cause of this eruption you may easily collect from the manner of the eruption of winds. How a sound is produced I have set down before. The differences of Thunders are various: Some are only murmuring without a multiplication of sounds, caused through a less proportion of fire and air, bursting through a less dense and thick cloud. Others raise a great cracking noise, hapning through the acuteness of the sound, smartly dividing the air and clouds, wherever it reaches. Lastly, some are great hollow sounds variously multiplied, hapning through the reflection and refraction of other dense and thick clouds driving in the way. Besides these there might be accounted many more differences of Thunders, raised through the proportion of air and fire that burst out, and the various mixtures of clouds.

* Like Gun powder suddenly taking fire, & causing a violent noise, when discharged out of a gun, or any other close hollow body.

Eulcoration or a *flashing* is fire condensed, raised into a flame through inflated air within a cloud, and breaking out from it. This scarce effects any great noise, because of its subtilty, although in some it doth.

Fulmination or Lightning differs from the former only in intention, in that it is much more forcible, reaching to the ground, and piercing into it and other terrestrial thick dense bodies, and is more augmented in matter. It is ordinarily a concomitant of Thunder, both being produced at once, although not perceived by us together, we seeing the Lightning before we hear the Thunder, because a visible object is much swifter communicated to the eye than a sound to the ear, as appears in spying a man a far off chopping of

B b b b b 2 wood,

wood, we seeing His Axe go down before we hear the noise; the reason of this I have inserted above. A Lightning is either *vibrating*, and is next to Fulguration in intention, passing more subally: Or *discursive*, consisting somewhat of a denser fire, and causing a greater Thunder. 3. Or *burning*, consisting of the densest fire, causing the greatest Thunder, and oft melting a Sword in the Scabbard or Moneys in a Bag, and the Scabbard and Bag remaining undamaged: The reason is, because the rarity of these gave a free passage to the Lightning, whereas the crassitude and density of the others did stay and unite the passing aduring flame. Strong men and beasts are oft killed through an aduring Lightning, whereas women and children do escape; because the bodies of these latter being laxe and porous suffer the said flame to pass without any great resistance, whereas the crassitude of the other bodies do unite and collect it, through which their vital heat is quite dispersed, having no other apparent sign either within or without their bodies of so sudden an alteration. *Wolfgang Mevener*, in his *Com. Meteor.* p. 140. makes mention of a man being suddenly seized upon on the way between *Leipsich* and *Torga*, and lifted up into the skies by a lightning, never appearing again to any; Wine hath sometimes been bound up together with a thin skin through the like accident, the cask being broke asunder: This doubtless, depended upon the incrassation and condensation of the external parts of the Wine, through the compressing force of the Lightning, impelling the aerial and igneous parts to the Center. Wine thus affected becomes very noxious and poysonous through the infection of the Celestial sulphur.

I must not forget to insert a word or two touching Thunder stones, differing in hardness and figure, some being Pyramidal, others Globous, Oval, or like to a wedge, &c. Touching their generation Authors are much at variance. *Sennert* opiniates, that they are generated upon the Earth, through the great heat of the Lightning melting, and afterwards concreting the sands into a very hard stone. A gross mistake.

1. These stones are observed to fall down from the Heavens after a thunder with such an acute pressing weight, that they are forced (according to *Pliny*, *lib. 2. c. 55.*) five foot deep into the earth, according to others 9 yards, and some would have them press to the Center of the Earth, but that is ridiculous.

2. A stone of that hardness is not generated in so short a time.

3. These stones must then be supposed to be generated without a *matrix*. But to the matter: They are generated within very dense and thick clouds, whose denser and thicker part is sequestred into a closer seat for a womb, where after some time it concreases into a stone: And lastly its greatest hardness is accomplished through the intense heat of the fire united within the same clouds, and happens to fall down through the great concussion and disruption caused by a Thunder.

III. To these Igneous Meteors a Comet is likewise to be referred, touching whose seat and production a deal of dispute is made: But before I direct my Pen to those particulars, it will not be amiss first to set down its description: A Comet or blazing Star is a fiery Meteor (that is a mixt body of no long duration sublimed into the air,) generated out of some dense fiery and thick airy parts contained within the clouds of the second region of the air. It chuseth a difference from its figure, colour, time, motion, duration and place, whence some are globous, beset round with fiery hairs, and therefore are called *Comete criniti*: Or others seem to be barded, whence they are termed *Comete barbati*: Or others again appear with a tail, and for that reason are named *Comete caudati*. Some appear in a light golden or yellow flame, others redish, bloody, dusky, red, &c. Some are moved slowly, others swiftly, some are moved more regularly than others. Some appear in the Spring, others more frequently in the Autumn, rarely in the Summer, more rarely in the Winter: Some are of a weekly, or monthly duration, others remain six months in sight. Commonly they keep their station without the tropicks, and but rarely some do appear within the Tropicks.

But in reference to their place of production, many believe their seat to be in the Elementary Region, viz. The upper Region of the air, that is according to their meaning, near the Concave of the Moon, where the actual flame of the Stars may the better kindle them, judging the coldness of the second Region to be very unapt for the generation of these bodies. Others again allot the Celestial Plage for their reception: And among these *Anaxagoras* and *Democritus* thought them to be the appearance of several Planets united in company and in their lights. *Pythagoras* asserted them

to.

to be Planets (but none of the seven Common ones) that had remained hidden all this while under the beams of the Sun, and through their digress from him came now into sight, in the same manner as oft befalls to *Mercury*. The first opinion owned by the Peripateticks doth somewhat thwart their own Tenents.

1. They asserted that the kindling of all the preceding fiery Meteors was occasioned through the intense coldness of the air in the second Region, effecting a violent commotion upon exhalations contained within its jurisdiction, whereby they were inflamed or took fire, and that in the night, because its season doth superadd somewhat to the cold: Whereas here they contradict themselves and maintain the second Region to be too cold for to kindle a flame.

2. There they proclaim the Solar or other intense heat to disperse and disperse the exhalations in the torrid Zone, and therefore fiery Meteors appear seldom there; here nothing but a flaming æth'ral heat will do it. What inconsistencies are these?

3. Can any one probably imagine, that such great heaps and mountains of exhalations, as the great Mole of a Comet requires at that distance, should be attracted to the highest Region of the air? It is a question, whether the whole Earth can afford so much sulphureous matter, were it all exhausted. Or if she could, would that intense coldness (as they imagine) of the second Region of the air, or those thick dense clouds of the lower Region give passage to such numerous and thick passengers? Or do you not think, that they would be sooner dissolved through the intense heat of the upper Region, than concrease into a body? Neither can Astronomers with their Telescopes discern in them such a propinquity to the fiery Region or Moon, but to the contrary a very great distance. As for *Democritus* his opinion, it is scarce worth the time to confute it; but let me confirm my own. I say they are generated in the second Region of the air; not that second Region, which the Peripateticks have chalkt out, but the middle between the lower and upper Region, where those stiff and permanent clouds are swimming; not beginning from the tops of the mountains, but from the tops of the Erratick clouds. The said permanent clouds move with the body of the air from East to West, and so do the Comets*.

* Except they be descended so low, as to find themselves seated within the upper erratick clouds.

2. The permanent clouds are alone capable of condensing and uniting

uniting those subtil exhalations, that are escaped the thick dense clouds of the inferiour Region, into a compact flame, durable for a certain term of daies, weeks, or months, according to the seat of that Region, and the quantity of exhalations. Neither is this flame apt to spend it self much, because it is (as it were) partially catochized through the privative coldness of the air and positive coldness of its clouds.

2. It is supplied with pure incrassated air, not infected with many dense terrestrial or thick waterish particles. Touching its hairs, they are nothing else but the light of its flame illustrating or obtending the air contained within those clouds in so many streaks; for it cannot obtend it equally all about, because it is permixt with water, whose crassitude will not bear obtension, wherefore it divides the water or vapours into small or narrow lanes obtending the air between them. Now if the water or clouds are equally pliable all about it, it appears hairy all about its Circumference; if the fore-part of the cloud be somewhat dense, and thence indisposed to give way, but resists, and only the back-part be pliable it formes streaks backwards seeming like a tail, and so according to the pliability of the air it flashes out in figures.

If you are free to understand by a Comet any new appearing Star, descending from its former seat, or lately generated, I must agree with you, that these are only seated in the lower fiery Region, some below or above the Moon; and in this acception I have made use of the name of Comets in some of the preceding Chapters.

Authors in treating of Comets seldom forget the inserting their predictions, which are 1. Storms. 2. Great drinesses. 3. Tempestuous Seas. 4. Earthquakes. 5. Great alterations to befall a Country by the death of their King or Prince. All the former are no more frequently consequents of Comets, than of all other fiery Meteors, because with those great stores of vapours and exhalations, there cannot but be a great proportion of flatuosities attracted, whose bursting out proves the efficient of the now mentioned effects. But as for the last, there can little reason be given for it, saving only that such a constitution of air causeth commotions of humours, and thence may cause diseases in general, but why it should light more upon such great personages than others, is beyond all guess, & therefore the truth of it is suspicious. Likewise the fabulous presages of other fiery Meteors may be placed in the same rank of dubiousness.

CHAP.

CHAP. XVIII.

Of the term *Antiperistasis* and a *Vacuum*.

1. *Whether there be such a thing as an Antiperistasis.*
2. *Whether a Vacuum be impossible; and why.*
3. *Experiments inferring a Vacuum answered.*
4. *Whether a Vacuum can be effected by an Angelical, or by the Divine Power.*
5. *Whether Local Motion be possible in a Vacuum. A threefold sense of the doubt proposed. In what sense Local Motion is possible in a Vacuum, in what not.*

I. I Could not conveniently without interruption of my Subject insit before upon the examining that term of the Schools, so oft assumed by them to expound the manner of generation of the fiery Meteors, viz. *Antiperistasis*, being described to be the intension of heat or cold in bodies, caused through the cohibition, repulsion or reflection of their own vertues by their contraries, without the addition of any new formal parts, or retention of their steams. Thus many Wells are cool in the Summer and warm in the Winter; and exhalations grow hotter in the cold region of the air, because of the *Antiperistasis* of the ambient cold against their heat, and of their heat again against the external cold; in effect it is nothing but the condensation (if such a term may be improperly used) or rather union of the qualities of the Elements by the resistance and collecting of their vertues by their opposites. But since the collection or uniting these qualities depends upon the condensation or inerrassation of their substances, there is no need of introducing another frustaneous notion. But suppose an *Antiperistasis* or intension of qualities without the condensation of their substances were granted, how do fiery Meteors become flames? Never a word of this. And when flames, why do they cause a disruption of the air in a Thunder? Because (say they) of avoiding a penetration of bodies: A good one, what fear is there of a penetration of bodies, when there is only an intension of qualities through an *Antiperistasis*, without an augmentation

augmentation of bodies? Possibly they will take their refuge to a contrary assertion, and tell me, that the foresaid disruption happens, because of avoiding a *Vacuum*. This is just like them to run from one extremity to another: But how a *Vacuum*? Because the flame pent close within consumes, or hath consumed or expelled its ambient air, which done, there must needs follow a *Vacuum*, if Nature did not prevent it, by causing the extrinsick air to break in, or the internal to break out for anguish. This is improbable; for the *Vacuum* may be filled up by the concentration of the ambient clouds.

Since I am accidentally here fallen into the discourse of a *Vacuum*, I will think it worth my labour to inquire, whether such a thing be naturally possible within the Circumference of the Universe. I do not mean an imaginary *Vacuum* without the heavens, neither a space void of any gross body, although filled up only with air, but a place or external Surface freed from air, or any other body. For answer, I assert a *Vacuum* to be repugnant to nature, because the nature of the Elements is to move towards one another, with the greatest force imaginable, through their respective forms, because of their own preservation: Hence the Elements would sooner change into a confusion, than be debarred from one *minimum*, without having its space filled up with another. Wherefore it is not enough to assert (as usually they do) that there is no *Vacuum* possible in Nature, because she doth so much abhor it, as if Nature was an Animal sensible of any hurt, and why doth she abhor? that they know not. However some state the cause of her abhorrence to be *Natures providence*, in ordering that sublunar bodies through mediation of interposed bodies should be disposed to receive the Celestial influences, which a *Vacuum* would otherwise eclipse from them? How frivolous! As if a moments partial vacuity, (which could through its being violent not prove lasting) should hinder a communication of the Elements, or as if the said influences could not be transmitted to sublunars by mediation of bodies, that limit the said supposed vacuity. *Arriaga* holds it to be for to prevent a penetration of bodies: That is *idem per idem*; for one might as well demand, why Nature doth so much abhor a penetration of bodies, and be answered, because of avoiding a *Vacuum*.

Vasquez, a Jesuit is of opinion, that Nature can never attain to a *Vacuum*, because every body is impowered with an attractive

Cccccc

virtue,

virtue, attracting the next body that is contiguous to it, in such a manner that no body can be stirred, except it attracts his next adherent with it; Oh how grossly! Doth fire attract water, or earth air? They all apprehend attraction to be violent, and notwithstanding they affirm Nature to abhor a *Vacuum* naturally, and how can this hang together?

III. Arguments for the proof of a *Vacuum*, many are offered, but none of any strength, however for your satisfaction I will propose some few.

1. A Bason filled up with ashes contains as much water poured into it, as if the same Vessel were void; *ergo* there must either be allowed a penetration of bodies, or a pre-existent *Vacuum*: But so antiquity hath found the Antecedence, *Ergo* the consequence must be admitted.

I must needs assert this ancient experiment to be an ancient falshood; for a bason filled with ashes will scarce contain four fifths of the water, that it will do, when it is empty: As for the water that is imbibed by the ashes, it possesses the spaces left by the air, contained before between the particles of the said ashes, and now thence expelled.

2. Warm water stoppt close in a bottle doth possess more room, than when being set in a cold place it is concreated into an Ice: *Ergo* there must be some void space left within the bottle.

I answer, That the supposed vacuity is filled up with frosty *minims*, whose presence expelling the air and fire from between the Pores of the water, doth withall reduce it to a smaller body, as being before inflated with air and fire: But when the same frosty *minims* do return, then the air and fire do fill up their vacuities again, by insufflating the body of water through their succession.

3. An *Æolipile* being filled up with water and air, doth notwithstanding blow as much fire, as will cause its wind to blaze a whole hour or longer according to the bigness of it: *Ergo* there must have been a *Vacuum* contained within the wind bale, or else we must admit a penetration of bodies by condensation.

I answer, That neither is necessary; for the advenient fire expels so much of the contained air as its presence doth take up, & diducts the body of the *Æolipile* somewhat into a larger continent, wherein a greater part of fire may be contained than there is air expelled.

Pecquet in his *Exper. Nov. Anat.* hath endeavoured to borrow all

all experiments possible for to divide the Universe with a *Vacuum*, and so to abolish the Natures of the Elements. I shall only propose the first, which he hath from Monsieur *Roberval*, Professor of the Mathematicks at *Paris*, and is alone performed by a glass blown in the form of a bolts head, open below and at top at its capacity, where it contains an empty bladder, that is usually taken out of a Carpes belly, being tied close with a thread, as likewise the top of the capacity with a Sows bladder: This done it is filled up to the brim of the orifice of the neck with Mercury, which being close stopped with ones finger is immitted into a vessel half filled with Mercury, and thrust deep into it, where the finger is to be withdrawn: Hereupon follows the descent of the Mercury as low as half way the Pipe, and the bladder is puffed up. Hence he deduces a *Vacuum* between the rarefied parts of the air, blowing up the bladder contained within the empty capacity. What a gross mistake is this!

First, He must know, as I shall prove by and by, that it is the air that presseth the Mercury down; for *whatever is moved Locally is moved by an extrinseick agent.*

Secondly, He doth against reason and experience state the rarefaction of some air: But whence came that air? There was none, whilst it was filled up with the Mercury; *ergo* it must have pierced through the pores of the Glass; If so, what needs he admit only a small quantity, which he supposeth to be rarefied after its ingress by an elaterick vertue, since a greater may as easily pass? and why then a *Vacuum*? Wherefore I say he must necessarily grant some air to pass the pores for to blow up the bladder: besides I prove, that it is easie for the air to pass through the pores of Glass; because we see, light doth easily pass the thickest Glass; but light is the air illuminated or obtained, as I have proved before, *ergo*. That Glass is pierced through with subtil pores is evident a little before it beginneth to concrease or indurate after its melting *. Moreover we see, that the liquor it self of *Aqua Fort.* being poured upon the filing of Brass, penetrates through the pores of a thick precipitating Glass: The same is observed about the Glass at the affusion of oyl of Vitriol to oyl of Tartar; but air is much more subtil than these Liquors. Do we not observe the air to press by the spurring of fire through glasses of the greatest thickness? For expose a thick glass of water to the fire, and you may observe it to be raised into millions of bubbles, when it

* Besides it appears plainly in a Thermometer.

begins to siethe, which is nothing else but the air forced through the pores of the Glass by the fire: In fine there is nothing that is imperforated by pores, except water and air in their absolute state. I omit the rest of his borrowed experiments, and shall only insert two words touching the conclusion, inferred from the pumping of the air out of a large round Glass Receiver, (in that manner as you have it proposed by *Casper Scott*,) which they conclude must afterwards remain void; on the contrary it is rather more filled by air, attracted from without, and impeded so clost, that the pores of the glass seem to be filled and insufflated with it, as appears by the venting of the Receiver so pumped into a vessel of cold water, where it causeth a very great commotion and siething by the air bursting out; certainly this is different from pumping the Receiver empty: or thus, they may pretend a *Vacuum*, because there is more air attracted into the Receiver than it contained before; *ergo* there must either a penetration of bodies be allowed, or a *Vacuum*. To this I need propose no other answer for solution, than what I gave for the solution of the eruption of air out of an *Æolipile*. How or in what manner air is attracted into the said Receiver by this *Magdenburg experiment*, you shall read in the next Chapter. As for other Arguments they being as vacuous as *Vacuum* it self I shall neglect the mentioning of them.

IV. But the Jesuitical Philosophers do further propose to themselves, whether a *Vacuum* could not be effected by an Angelical power, or if not by Angels, whether by the Divine Power. This is as like them as if it were spit out of their mouths: Those vile Impostors and the devils Saints will name God *Almighty*, and notwithstanding to his face doubt of his power in so mean a thing as a *Vacuum* is; what, if God can destroy the Elements intirely, cannot he displace them partially? Angels I confess cannot effect it naturally and ordinarily, although extraordinarily being virtuated with an extraordinary power from God they may.

V. Next they rommage, whether Local Motion be possible in a *Vacuum*; and if it be, whether it must not happen in an instant.

I shall not weary my self to produce their opinions, but only oppose what reason doth direct me. But let us first state the question right: The Problem may be understood in a threefold sense.

1. Whether a Local Motion be possible in a *Vacuum* as through a Medium,

Medium, through which a body being locally moved passeth, taking its beginning of progress from without the said *Vacuum*.

2. Whether a body can take its beginning of motion outwards from a *Vacuum*.

3. Whether a spiritual substance obtains the power of moving it self locally in a *Vacuum*, or through it, without taking its first impulse from against a body, whence through reflection it might pass through.

This premitted, I answer that according to the first intention a *Vacuum* is capable of giving a passage to a body locally moving through it, provided it takes its progress from without upon an immoveable center.

I prove it, Air, Fire, and the other Elements move through a *Vacuum*; for otherwise did they move through another body, it would infer a penetration of bodies: If then the Elements obtain such a power, *ergo* consequently their mixt bodies.

2. This Maxim *Omne mobile sit super immobili. i. e.* All moveables move upon an immoveable body, is alone to be understood of the foundation of motion, *viz.* That all moveables must move from an immoveable Center, that is, take their beginning thence, either by impulse, reflection, refraction, or continued protrusion.

3. That *Motion*, whereby a moveable passeth through a *Vacuum*, is continued upon its own Center, or upon another body instead of a Center; for all motions must take their beginning upon an immoveable, or at least upon that which is not inclined to the same motion, in the same swiftness that the body, which moves upon it doth.

4. A single body can neither press through, nor move (that is out of its place,) locally in a *Vacuum*, because it enjoying its Center, and not being violently detained, would rest upon that Center.

5. Neither can a mixt body move locally, that is, change its *ubi* in a *Vacuum*, because the reason of a bodies changing of its *ubi* is the impulsion of another body, striving for its center upon it: For example, water moves upwards, because the air striving for its Center protrudes it out of its seat upwards, as hath been mentioned; air being compressed within the body of water is moved out of it, because of the waters compression downwards, whereby it is squeezed upwards; But not through its own motion. Now in a *Vacuum* there

there is no external body to strive or to impell upon it.

6. A body would not cease to move locally internally, because of the violent detentions of the Elements contained within, pressing one another away from the Center.

7. Suppose there were a confusion of the four Elements as big as a fist cast without the Universe, they would change their internal places, as the Elements changed theirs in the *Chaos*, viz. The weighty Elements being less in extent would sooner gain the Center, than the others, and as for the rest they would move in the same manner, as the Elements move here, but of this more in the next Chapter: And now you may easily comprehend that the present world doth not at all change its *Ubi*, but is immoveably fixed, although continually changing its internal places.

8. Angels, if conceited to be pure spirits may move in and through a *Vacuum*, but if apprehended to be of a circumscriptive quantity, they cannot.

CHAP. XIX. Of Physical Motion.

1. *What a Physical Motion is; The kinds of it; The definition of Alteration, Local Motion, and quantitative motions. The subdivision of Local Motion.*
2. *That all alterative and quantitative motions are direct.*
3. *That all external motions are violent.*
4. *That all weighty mixt bodies, being removed from their Element, are disposed to be detrudd downwards from without; but do not move from any internal inclination or appetite they have to their universal Center.*
5. *The causes of swiftness and slowness of external Local Motion.*
6. *That light bodies are disposed to be moved upwards.*
7. *That airy bodies, being seated in the fiery Region, are disposed to be moved downwards.*

I. **T**HE same reason, that perswaded me to treat of a *Vacuum* and *Antiperistasis* in the preceding Chapter, is also a motive why I deferred the Treatise of Physical motions hither.

Physical motions are so called in opposition to *Hyperphysical* or *Metaphysical*, and are proper to natural bodies. A *Physical motion* then

then is a change of a natural body in any one or more of its *Physical modes*, or in all: A change is a (*transitus*) passing from that which is not to that which is to be: Whence we may plainly collect the differences of it to be as many, as it may vary in its Modes, and intirely in its Essence: *viz.* Physical motion is either to quantity, quality, action, passion, relation, situation, duration, to a new Essence, &c. and particularly to a greater or less quantity, to colour, figure, heat, coldness, &c. This infers, that there are many more universal differences or kinds of motion than *Aristotle* stated: However I shall only insist upon these three, as being most taken notice of: *viz.* *Alteration*, which is a change of a quality of a Physical being: External Local motion, which is a change of the external place wherein a natural being is seated: And *Auction* and *Diminution*, which are changes of the quantity of a natural being. Alteration (as I said before in the Chapter of *Colours*) is nothing else, but the change of internal places of the Elements in a mixt body: Thus a body grows hot, when the intrinsic fire of a mixt body begins to be more united and condensed; and is nothing else but the change of internal places, which by this fire were dispersed, and now are reduced in o a lesser number, or into places more united and less remote. So a mixt body happens to grow colder, when the *earthy minims* within it change their places, and are reduced to nearer places, and so grow more piercing to the center; apprehend the same of the other qualities. External Local Motion is either understood in a large sense, as it comprehends alteration or change of internal places, or as it denotes a single internal motion from an internal place to an internal place, and in this acception we have made use of the word above in assigning the forms of the Elements; or strictly it is restrained to external Local Motion, which is the change of an external place in natural bodies: That is, whereby natural bodies are moved out of one external place into another. The universal Elements naturally and strictly are not subjected to Local Motion, since their change of place is only internal, to wit, within one another: Whereas external Local motion is restricted to the change of an external place, however we may improperly or in a large sense conceive them to move locally. Neither are the Elements capable of auction or diminution, because their quantity and forms are definite; wherefore they are only apt to undergo alteration, or change of their internal places, like we have hitherto demonstrated.

demonstrated. Mixt bodies are disposed to the change of their external and internal places: Of their internal it is apparent, since they are never exempted from alteration; heir external is no less obvious. Auction or Diminution are changes of the Elements in a mixt body both of internal and external places: That is, do comprehend a local motion and alteration. The subdivisions of these three are various; but for brevities sake we shall here only appose that of external Local motion: Which is either direct, reflex, or circular. A *direct motion* tends singly from one point to another in a right line. A *reflex motion* is either strictly so called, and is whereby a moveable is reflected or beaten back towards the point (either perpendicularly or obliquely) whence it first moved; or *refracted*, (as they vulgarly term it) whereby a moveable is moved in an oblique Line to a *terminus ad quem*. A *Circular motion* is an oblique motion into a circle: This is either singly circular, whereby a motion is contorted into one circle; or manifold and reflected, whereby it is either spirally, or vortically (that is, like a whirl-pool) contorted into many circles; each inferiour circle being reflected into a greater superiour one, or each superiour greater circle being reflected into somewhat a lesser inferiour circle. Lastly, Motion is either swift, slow, or mean: The first is, which in a short time doth absolve a long space; The next, which in a long time absolves but a short space: A mean motion is, which in a long or short time absolves a mean motion. These definitions and divisions premitted we shall next adscribe some useful Theorems.

II. All alterative and quantitative motions are absolutely and *per se* primarily direct: That the primar and natural motions of the Elements are direct, their definitions testifie; For since they do each primarily move from their Center to the Circumference, or from the Circumference to the Center, and that all motions from the Center to the Circumference, and from the Circumference to the Center are direct, it must necessarily follow, that those said motions primarily adscribed to them are direct.

2. All external Local motions proper to mixt bodies being moved with an Element, that enjoys its Center are direct, because such bodies being moved by the said presupposed Element must be directed to the same term, that the Element is, which as hath been proved is likewise direct.

III. All external Local Motions are violent, or moved by an
extrinick

extrinſick movent: That is, no natural body, whether mixt or ſimple, can or doth move it ſelf locally *. * To wit externally.

I prove it: external Local Motion is cauſed by expulſion; but all expulſions (as the name it ſelf doth import) are cauſed by an external principle, expelling the body, that doth diſrupt or diſpoſſeſs it of its place: *Ergo*. I confirm the *Minor*: what, can a body be ſaid to expel it ſelf? Expulſion is cauſed by the body injured, but that is the diſcontinuated and external body only; *Ergo*.

2. The body expelled enjoys a center; *ergo* it cannot move for one, ſince all motions are for a center.

3. External Local Motion is cauſed by compreſſion, but a natural body cannot compreſs it ſelf: *Ergo*. Poſſibly you may ſay, that a body may compreſs the extraneous body, and ſo liſt it ſelf up: No, for if ſo, then it is rather liſted up by the renitency of the extraneous body. But how is a natural body capable of compreſſing an extrinſick body? What? By rarefaction; well, if ſo, a body cannot rareſie it ſelf: Poſſibly you will ſuppoſe a virtual rarefaction proceeding from the internal form of a body, and ſuch a quality is not in *rerum natura*.

4. The name it ſelf makes the ſame inference: *viz.* External Local motion is a change of external place; *ergo* the vertue changing muſt proceed from without or externally; becauſe it is impoſſible, that an internal power ſhould reach beyond its ſphere of activity, which extends no further than its internal body or matter. All bodies do naturally covet reſt from external Local motion; *ergo* the ſame external motion muſt be violent, or from without. Doth earth (that is in particles) ever move Locally out of its place? No, but is attracted or forced upwards (as in exhalations) by extrinſick efficient, as external air and fire: *In ſumma* all inſtances in the world do confirm to us, that external Local Motion is from without. But I inſtance in particulars: A Bullet being ſwallowed down by any living Creature is detruded downwards and evacuated by ſtool; but if thruſt down its throat, when it is dead, reſteth in the body; *ergo* it is the depreſſing vertue of that living Creature doth extrinſeckly move it locally, ſince when it is dead the bullet is not affected by any ſuch motion.

IV. All weighty mixt bodies, being removed from their Element, are diſpoſed to be detruded downwards from without; but do not move from any internal inclination they have to their uni-

D d d d d verſal

versal center. I prove the latter part; because all bodies can obtain but one motion for their preservation; but that is of moving to their own center, whither, whence and whereupon they move; *Ergo*. The *Minor* is confirmed, by that we see, that water and earth in an extraneous Element, as in the air or fire, do move to their own particular center, as appears in drops of rain, that fall down from the air. Doth not Mercury move directly to its own center, although it be never so many times divided? Do not air and fire erupt out of the water in a round bubble? *Ergo* their motion was from their own center, as appears by their rotundity. Doth not a flame in a candle strive to maintain its center? I shall add one argument more: A part retains the nature of the whole, which in a weighty body is of moving to its own center, *ergo* all weighty bodies do primarily move to their own center: Amputate any member of a living Creature, and you will find it to shrink immediately into a rotundity, or towards its own center; whereas had it any inclination or appetite to that body whence it was prescinded, it would remain in the same shape and form it was cut off, for so it would be aptest to be reunited. If then all weighty bodies do primarily move to their own center, how can they then existing in the air move or have an inclination of moving down to the earth, since they in moving to their own particular center do manifestly move from her? *Ergo* there can be no such thing as an appetite or inclination in mixt bodies to an universal center, when separated from it; although when united, they have a particular respect to it as a part hath to the whole.

Next I prove the first branch of the *Conclusion*, *viz.* That all weighty mixt bodies being seated without their Element, are disposed to be moved downwards. *Downwards*, quasi *to it* (namely to the center) *wards*, or *into it wards*. *Upwards* quasi *outwards*, that is, from the Center to the Circumference: Likewise the German Synonyma's confirms this Etymology, *viz.* *Nach beneden* (or downwards,) quasi *Nach binnen* or *inne*, that is into wards: Or *nach boven* (upwards) quasi *butenwarts*, and that quasi *ouswarts* or outwards. Whence we may learn, that in every particular mixt body there is as properly a *downwards*, and an *upwards*, as in the universal body: So then the fore-stated *downwards* is to be understood to the earthwards, (that is to the terraqueous Globe) and *upwards* from the earthwards. I say they are disposed to be moved
downwards,

downwards, because they cannot move themselves thither, but concur to that motion only by their disposition.

V. This disposition is nothing else but the renitency or stubbornness of the weighty mixt body discontinuating the air or fire, and resisting their motion to the center-wards; the intension and remission of the said renitency depends upon the greater or lesser density or crassitude; whence it is also, that some bodies are moved swifter downwards, because they consist of a greater density*, sustaining a more violent impulse of the air, which were they less dense, would be moved slower, because of a less renitency.

2. Or thus, the air being discontinued by an interposed weighty mixt body doth primarily strive from all parts to a reunion by its expansive vertue, especially from above, because of its greater strength there, as being less discontinued and weakened by exhalations and vapours; whence the greatest force descending doth also direct the impulsion downwards. Wherefore a weighty body, as Mercury or any other Mineral, is moved much swifter downwards or (according to the ordinary Ideom of speech) weighs much heavier, on the top of high hills, than below. But you shall read more in the next Chap.

VI. All light bodies being seated in a weighty Element are disposed to be moved upwards, whence it is that subterraneous air is oft forced upwards by the earths compressing vertue: Likewise a piece of Cork depressed under water is by the waters gravity closing underneath (in the same manner as we have explained it in the 2. Part. the 1. Book, Chap. 16. 2. Par.) squeezed upwards, without any intrinsic propensity; for otherwise the same Cork being also disposed to be pressed downwards in the air must be supposed to have two internal propensities, which is absurd.

A flame burning in the airy Regions is forced upwards by its disposition of levity, tenuity and rarity: Thus; The air finding it self injured by the discontinuating flame presses upon her and strives from all sides to squeeze her away; The flame being overpowered is forced to slip or slide away, whether its disposition may best yield; downwards it cannot tend, because there it is resisted by the courser air infested with weighty peregrin Elements; Ergo upwards, because there it finds the way most open to give free passage to its light rarity and tenuity: On the contrary, a weighty body, because of its density and crassitude, finds the passage clearer

D d d d d 2 downwards

* Besides acutenesse, as we have observed in the 1 B. 2 Par. is a concomitant of Density, whereby a weighty body is also the better disposed to cut through the inferiour part of the air, when pressed from the superiour.



downwards, by reason it is most driven from the tenuity of the air atop: but supposing the air to enjoy its center doubtless those weighty bodies, would be cast forth upwards to the Circumference.

VII. Ayry bodies, that are seated in a fiery Element, are moved downwards, because the rarity of the fire, sinking downwards for a center, doth impell them also thither, whose disposition being continuous and thin are the better disposed to slide away from the fire (compressing them all about) downwards, because upwards the said bodies striving to maintain their particular Centers would be more discontinued, where the force of fire must also be strongest: Whence you may observe, that weighty bodies and light bodies are both moved to one *terminus ad quem* in the fiery regions.

Touching the causes of refraction and reflection you shall read them in the next Chapter.

Hence a great part of the first Book of the second Part, will be rendred much plainer, which I did forbear to illustrate further, because of avoiding needless repetitions, intending to treat of these by themselves, viz. why water or any other weighty body, being violently detained, is much intended in its strength; or why water is more depressing atop, or when it is most remote from her Center than underneath, namely because of the depression of the air, adding much to the drowning of a man, as we have mentioned in 12th. and 16th. Chapters, and so many other passages.

CHAP. XX.

Of Attraction, Expulsion, Projection, Disruption, Undulation, and Recurrent Motion.

1. How air is attracted by a water-spout or Siphon.
2. The manner of another kind of Attraction by a sucking Leather.
3. How two flat Marble stones clapt close together draw one another up.
4. How a Wine-Coopers Pipe attracts Wine out of a Cask.
5. How sucking with ones mouth attracts water.
6. How a Sucker attracts the water.

7. The

7. *The manner of Attraction by Filtration.*
8. *The manner of Electrical attraction.*
9. *How fire and fiery bodies are said to attract.*
10. *What Projection is, and the manner of it.*
11. *What Disruption, Undulation, and Recurrent motion are.*

I. **I** Thought fit to subject these remaining kinds of motion to the preceding, and to treat of them in a distinct Chapter: viz. *Attraction, Expulsion, Projection, Disruption, Undulation, and Recurrent motion.* I shall only insist upon some particular kinds of attraction. What Attraction is, the name doth explain.

How air is attracted by water, and water properly by air, hath been proposed in the foregoing Chapters; Attraction is further evident.

1. In a *Siphon* or water-spout, wherewith they usually cast up water for to quench a fire. Here the water is attracted by the drawing up of the Sucker; not through a bending for to avoid a *Vacuum*; but through the natural cohesion in continuancy of the air to the Sucker or aerial parts contained within the Sucker: Now the air doth cohere more strongly, because there is no body to discontinue it within the *Siphon*, but is rather assisted in a continued cohesion by the continuiry of the sides of the *Siphon* and of the Sucker. Or otherwise if the air did strive to separate, how could it? For suppose it should be discontinued from the Sucker, then through that discontinuation there must be some certain void space effected: if so, then that air, which did before fill up that void space, must have been withdrawn into some other place, or else it must through penetration have sunk into its own substance; besides the air that was expelled upwards must have penetrated into its own body by condensation, or into the body of the water, all which is impossible, since a penetration of bodies is an annihilation. But here inquiry may be made, whether it is the continued cohesion of the air with the water causes the succession of the water upon the air; or whether the air, which through haling up of the Sucker is expelled upwards out of the *Siphon*, doth for to procure a place protrude the air cohering about the external sides of the *Siphon* downwards into the water, through whose insufflation the water is propelled upwards into the *Siphon*. I answer both waies; for it is impossible, that such a great weight of water should ascend.

ascend so easily with so little a force as the attraction of the Sucker, unless it were assisted by the strong force of the air pumped out, out of a necessity and impossibility of shrinking pressing down, and protruding the water upwards. That this is so, the external circular pressure and dent, which we see about the outsides of the water about the lower end of the Siphon, and the internal puffing up of the water within the Siphon do testifie.

II. Another kind of Attraction not unlike to this is observable in boyes their sucking Leathers, being wetted and clapt flat upon a stone, and afterwards drawn up with a pickthread fastned in it attracts the stone with it. The cause is alone the continuous cohesion of the water to the stone, defending it self from the disruption of the air, the which as soon as breaking through occasions the separation of the Leather from the stone.

III. Two smooth flat equal Marble stones clapt close one upon the other, the uppermost attracts the lowermost, if equally lifted up from their Center, by a ring fastned to it, because of the air through its continuity sticking fast to the lowermost and the undermost stones; but if disrupted through an unequal lifting the lowermost stone falls.

In the same manner doth a plain board cast upon the water attract it into a Rising, when lifted up by the central part.

IV. A *Wine-Coopers Pipe* attracts Wine out of the bung-hole of a Cask: The Pipe is somewhat long, and narrower towards the bottom and the top, but wider in the middle, which thrust open at both ends into a Cask full of Wine through the Bung-hole, and afterwards applying one's Thum close to the hole atop may attract a competent quantity of Wine out of the Vessel, which with the opening of the upper hole runs out again. But methinks that this and the forementioned attractions might rather be termed cohesions or detensions, since that which doth attract is the extrinsick attractor, *viz.* ones arm. The cause of its attraction is the immission of the Pipe into the Cask, to a certain depth, where the air being excluded from it and closed with your Thumb, you will find a drawing or sucking to your Thumb, which is nothing else but the weight of the Wine pressed downwards, and notwithstanding cleaving fast to the continuity of your Thumb, which being continuous and obtuse doth sustain the liquor continuatd to it; whereas were it subtil, that it could give way as the free air, it would

would not be contained so. But suppose you thrust a Beaker with the mouth downwards under water, and stop a small hole made on the bottom of it with your Thumb, the water would not keep in there, because the air would enter underneath, through which the parts of the water would be disunited, and so desert the supposed cohesion of parts: why the Wine descends at the opening of the upper hole, is through the impulse of the air entering.

V. The sucking of water through a Reed by the mouth is effected, by causing a flat close cohesion of your Tongue and lips with the continuous parts of water or air; for what is contiguous cannot be sucked (unless by means of its inherency in continuous bodies,) because its parts are unapt to cohere. To all these kinds of cohesions or adhesions the closeness of sides of those external bodies, that cohere together through the internal cohesion of air, doth mainly contribute by keeping off the discontinuating air; as the closeness of the sucking leather sticking, of the two Marble stones, of the sides of the Wine-Coopers Pipe, of the Lips in sucking, &c.

VI. A Sucker, otherwise called a *Siphon*, being a Pipe consisting of two arms of an unequal length, meeting in a curvilinear Angle, attracts water out of a Vessel untill it be all run out, provided it be set running by sucking the water down to the lowermost part of the longer arm, being placed without the said Vessel. This instance gives us a plain demonstration, that attraction is caused by the means of the cohesion of continuous parts to other continuous ones, especially if separated through a close Cane from dividing bodies (as the air) and by the same cause kept close together; for water as I said before, will always through its weight and continuity cohere and keep close to its next central parts, and never separates unless through a disunion by the air or other bodies. Hence it is also, that water is easily led to any height *, if impelled by any force through a close Pipe, or by a Sucker. But why water contained within the shorter arm should yield to water contained within the longer may justly be doubted: The reason is, because the water contained within the longer Pipe being more in quantity is heavier than the other, and therefore prevails, and is more disposed for to be pressed downwards: But then you might reply, That the water of the shorter Pipe is assisted in weight by the other proportion contained within the capacity of the Vessel. I answer, That the water of the shorter arm is impelled forward through the pressure of the

* As in fountains that are led over a mountain, or in Machines that raise the water higher than its source.

said

said water contained within the capacity of the Vessel: But not through its own gravity pressing downward towards the Center of the world; for every proportion of water (as I said before) retaining the nature of their universal Element only strives for to maintain its own center, and therefore water if enjoying a center within its own Circumference, wherever it be, doth not press or weigh, but strives to maintain its nature in rest: But that, which doth cause a force upon water downwards in the Vessel, is the strong sinking down of the air tending downwards for its Center: For otherwise water in a Vessel would contain it self in a round figure, which it cannot, because it is reduced to a flatness by the sinking air.

VII. Attraction by *Filtration* is performed by causing one end of a piece of Flannel or other wollen cloth to hang into any Liquor over the brim of the containing Vessel, and the other end into an empty one, whereby the light parts of the water ascend up the cloth, and distill into the other Vessel. This is effected by separating the thick parts of water and rarefying it through the labels subtil fibres, whence the other heavy parts of the water by descending downwards and being pressed by the air do over-press its subtiler and aerial parts upwards, the grosser and heavier remaining behind. By this it appears, that Filtration and other kinds of Attraction already mentioned are not so much Attractions as violent Expulsions. As the water of a Sucker will not run out unless the longer arm exceeds the depth of the water in length, so neither will water attracted by a filter distill down into the empty vessel, unless the distilling Label be lower than the water contained within the other Vessel for the same reason.

VIII. Attraction effected by Amber or other Bituminous bodies, otherwise called Electrical attraction, depends on emanations or continuous steams emitted from Amber (especially if rubbed) consisting of incrassated air and fire, being impelled circularly untill where they are gathered by a continuous body, which if light do return with those emanations upwards; for the said emanations being diducted, expansive and light, are by the weighty (*comparative*) vaporous air of this lower Region striving to keep their nearness to the center squeezed and propelled upwards, which commonly tends to the emitting body, because the greater quantity of those steams are gathered perpendicularly under the said emitting body, and so do

do return the same way. Hence observe, That Amber doth not attract so potently on the top of high Mountains, because its steams, being weightier than the air is there, do spread themselves further, whereby they are deprived of a return: Neither will Amber attract in a thick vapourous air, because its steams are detained from dispersion.

IX. Fire and fiery bodies, as Onions, Soap, &c. are said to attract; but improperly, because their attraction is nothing else but an expulsion of those bodies, which they are imagined to attract; For instance: Fire is said to attract water, air, &c. This is nothing else but fire piercing into the substance of water or air, whereby it doth expel them into those places, which it leaves, or which are near to it: Hence vapours are seldom attracted, or rather expelled into the places where fire doth continually pass, as directly under the *Æquator*, because it fills those places with its own presence, but are reflected towards the sides as towards the North and South Pole, whose spaces are not filled up with its torrid rays. Now judge a little of that most barbarous practice among Physicians in applying Reddishes, Salt, leaven, yea Epispastick Plasters to the Wrists and Feet of Feaverish Patients: What rage, what torments are poor men put to, how are their Feavers, Paraphrenses exacerbated through their diabolical practice? These things do not attract without piercing into a mans Veins and Arteries, and through their greater force of heat and violence do protrude the less heat of the body, and by a short stay do put the whole body into a consuming fire; How many men have I seen murdered in that manner? 'Tis true in malignant and Pestilential Feavers they have their use, but not in single putrid ones. Now by what hath been proposed in this Paragraph we may easily apprehend the manner of all water-works, and of raising water higher than its source, as that which is performed by the invention of *Archimedes* through a brazen or leaden Serpent, or by wheels impelling water into Pipes, &c. Hence we may also conceive the manner of the attraction, or rather expulsion of the degrees of water in a *Thermometer*, or invention to measure the degrees of heat and cold, and the differences of them in several Rooms, Towns, Seasons of the year, &c. The Instrument is nothing but a long glass Pipe, towards the end somewhat turning up, being left open for to poure in any liquor, which according to the rarefaction or

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condensation of the air contained within the Pipe above will either ascend or descend in so many more or less degrees, as the air is altered by rarefaction through the heat of the ambient air, or condensation through the cold *minims* of earth within the said ambient air compressing the water more or less through its increase of quantity.

Touching the *Magdenburg* Invention; the air is attracted outwards in the same manner, as we have explained the attraction of water by a water-spout, namely by a continuation, cohesion, and adhesion to the Sucker: The air attracted out of the capacity of the Receiver doth also through the same means attract air and fire, inhering in the rarefied and attenuated water without in the koop; that again in the koop attracts air from without for to fill up its spaces, which is as ready to press in, because that air, which was pumped out of the capacity, wants room without. This succession of air is continued by pumping, untill the air within is quite filled up with the incrassated air attracted from without, whose thickness will not suffer it self to be pumped out any longer; so that, as the air within begins to be incrassated, so the pumping without falls harder and harder. Towards the latter end there seems to be a forcible retraction of the Sucker making a great noise through its return, because the capacity of the Receiver being replenisht to the very pores of the glass, which being rendred somewhat flexible through the passing and tumefying of the incrassated and rarefied air, afterwards beginning to condense through greater access of fire, is violently through the great external force of the pumping somewhat forced to bend or yield inwards, whose renitency and force to return retracts the Sucker through continuation and cohesion of the incrassated air.

Next we are to pursue the manner of acceleration of weighty bodies downwards. It is certain that a natural mixt weighty body, falling directly down from atop without interruption to the bottom, doth acquire a greater celerity the further it recedes from the beginning of its descent; because the lower or farther it descends through propulsion of the superiour air, the more and the greater body (*viz.* of air under it) it compresses, which for to prevent the penetration of its own body is the more and violenter irritated to run round about the descending weighty body for to recover the place left by the said body, where arriving doth as it were rebound
against

against the superiour parts of the air, which doth very much intend the celerity of the said bodies motion; and the same gradually increasing doth also gradually accelerate the descending body the further it falls. Some are of opinion, that the acceleration of descending bodies is caused by Atoms falling down from the Celestial Orbs, which as they do more and more encrease by being retained by the descending body, do likewise more and more accelerate its descent. This can scarce be, because those Atoms, reflecting and returning from the Surface of the Terrestrial Globe, are in greater number underneath the body than above; *ergo* according to that manner of reasoning a body falling from on high should rather be gradually retarded.

2. A body should also fall swifter in the Winter than in the Summer, in cold Countries than in hot, because those Atoms are most numerous there; but the contrary is true. *Ergo* no true consequence.

In like manner do light bodies acquire a greater swiftness in ascending, the higher they are propelled, whence it is that Fowl flying high move much swifter than below. *Retardation* is caused through causes opposite to these now mentioned.

X. *Projection* is, whereby a body is moved swifter by the forcible impulse of the *Projector*, than it would do otherwise. Thus an Arrow is swiftly moved out of a Bow, or a stone being cast out of the hand; because of the force of the impulse of the *Projector*. The cause of the intention of this impulse is the great swiftness of the said impulse * at the beginning, whereby the air is swiftly propelled before, whose most swift return about the sides of the body projected causes the continuation of the swiftness of the first impulse, but gradually diminishing by how much the further it recedes from the beginning. A ball projected out of a Canon is propelled with that swiftness, because of the swiftness of the first smart impulse. The truth of the foresaid reason and manner is apparent in shooting a pole through the water, where we may see the water at the farther end raised into a tumor, which running * about the sides to the other end causeth its propulsion: Whence it is also that when there appears no more of the tumor of the water before the pole, its motion doth instantly cease.

* To wit, impressed upon the air by the *Projector*.

* Namely, for to recover its place and to avoid a penetration of bodies.

XI. *Disruption* or bursting is a sudden separation of the parts of a body through a violent force moving from within. This we see

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happens oft in Canons, when over-charged; or in bottels filled with water being frozen in the Winter, or Wine in the Summer being close stoppt: The cause of these latter must be imputed to *frosty or fiery minims*, entering through the pores of the bottels in greater quantity than their capacity can take in, and disrupting them for to avoid a penetration of bodies. Bodies are oft said to burst through drinefs, (as Instruments, &c.) but very improperly, since it is the fiery or frosty *minims* entering their pores and filling their capacities, and afterwards disrupting them because of avoiding a penetration of bodies: So Instrument-strings are apt to break in moist weather, because their continuation is disrupted through penetration of moist bodies into their pores.

Undulation is a motion, whereby a body is moved to and fro, like to water shaken in a basin, or to the motion of a Bell. The cause is likewise adscribed to the first motion of the *Impulsor*, which being terminated at the end of its return is beat back through the direct descent of the air impelling it, by reason it lieth athwart.

Recurrent motion being but little different from this, I shall therefore say no more of it.

The cause of *reflection* is the return of the impulse impressed upon the air or water (both being *media deferentia*) perpendicularly or obliquely upwards from a hard and plane reflecting body: Of refraction, the cause is the shoving off of the impulse downwards by the shelving sides of an angular hard body.

CHAP. XXI.

Of Fire, being an Introduction to a New Astronomy.

1. The Fires division into three Regions.
2. The qualification of the inferiour Region. What the Sun is. What his torrid Rayes are, and how generated.
3. How the other Planets were generated.
4. How the fixed Stars were generated.
5. A further explanation of the Stars their Ventilation. That there are many Stars within the Planetary Region that are invisible. Of the appearance of new Stars or Comets. Of the Galaxia or Milk-way.
6. That the fiery Regions are much attenuated.

I. The

I. **T**He ground of the fires tending downwards you may easily collect from what I have set down touching the waters and airs commerce with the other Elements. Its profundity we may likewise divide into three Regions; The first whereof containing the Planetary bodies, the next the fixed Stars, and the third consisting most of pure fire.

II. The inferiour Region, through its nearer approximation to the air and its immersion into it, is cast into a subtil flame, whose subtility doth effuge our sight and Ta^{ct}. The Sun is a great body generated out of the peregrin Elements contained in the inferiour igneous Region, consisting most of condensed fire and incrassated air, extended and blown up into the greatest flame, and conglomerated within the greatest fiery cloud. These igneous clouds are like to the windy clouds of the air, which as they do daily blast down wind upon the earth, so do these cast fiery rayes, among which that, which surrounds the Sun, doth vendicate the greatest power to it selfe. The manner of casting of its fiery rayes is the same with that of winds: *viz.* The Region of fire forceth up ^{* In the same manner as we have described the air to force up water in vapours.} every day or continually a great quantity of air, somewhat incrassated and condensed, into its own sphere through its descending force striving for a Center: This incrassated and condensed air is impelled violently into the body of the Stars by other subtil flames, as being more forcible to drive the said adventitious matter from them, because their parts are so closely ingaged, that they can scarce stow a *minim* without a penetration. Wherefore they must necessarily be impelled gradually into the bodies of the Stars, because these are mixt bodies, that give way so much in themselves by expelling fiery or torrid *minima's* down into the air, as to be capacious enough of receiving so many airy particles, as the Elementary fire doth force up every moment. But before I proceed in unfolding the manner of the Celestial mixt bodies their ventilations; I must insist somewhat further upon their constitution.

III. The Celestial mixt bodies are not only like to clouds in their daily and minutely ventilations, but also in their constitutions: *viz.* The inferiour ones (as the Planets) are constituted out of the courser and more mixt matter of the finer cloudy air in the inferiour Region of the Element of fire, like the clouds of the inferiour Region of air are constituted out of the courser part of vapours.

vapours. Their coagulation is effected through the force of the fiery Element crushing their matter from below upwards, and again is repelled back from the superiour parts of the said fiery Elements, because through its being pressed up are scantied of room, and therefore do press downwards not only for room, but also because of reuniting where they are divided by the said coagulated bodies.

Now it may easily appear to you.

1. Whence that rotundity, or rather globosity, doth arrive to them, *viz.* because they are circularly crushed.

2. Because the air and fire of the said Planets do naturally spread themselves equally from the Center to the Circumference, whence a circular figure must needs follow. Also,

3. That Stars are nothing else but the thicker and denser part of the Heavens, coagulated into fiery mixt bodies; to wit, flames.

3. That as they do decrease by Ventilation every day, so they do also increase by the intromission of new aerial particles.

4. That they must necessarily be very durable, because of the duration of their causes: For as the great force of the inferiour parts of the igneous Heavens never desist from striving for the Center, and do every day cast up great proportions of aerial matter, so do the superiour parts never cease from compressing them into the bodies of the other condensed flames being disposed (as I said before) through their ventilation to receive them.

2. Because the aerial parts, being got into the Center of the flames, cease from all external Local motion, striving only to maintain their Center in rest.

IV. Fixed Stars are generated out of the subtiler parts of the fore-mentioned aerial evaporations *, being through their less resisting gravity (redounding from water & earth in them) rendered capable of being screwed up higher to the second Region, where they are coagulated through the same motions of the Heavens that Planetary clouds are. These are responding to the permanent clouds of the second Region of the air, which as they are spread into more large extended bodies, wherein many knobs seem to be unequally coagulated through the unequal proportion of the mixture of the vapours, even so are these evaporations coagulated into long large bodies, within which again other coagulations are effected of unequal proportions, rising like so many knobs of various magnitudes, which constitute the fixed Stars, well deserving the *Epithete* of being *fixed* or *fastened* in those vast igneous clouds.

* To wit, being incorporated with fire.

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We diduct hence: 1. That the fixed Stars are smaller than the Planets, because their matter is the *overplus* of the Planets.

2. That they were formed after the Planets, because their matter must be arrived to the first Region, before the subtiler parts could appeal to the second Region for the matter of others.

3. That the difference between the loose and fixed Stars is no other, than that these latter consist of a more compact flame than the others, and thence we may also collect them to be more durable.

V. But to make pursuit of the manner of ventilation of the Stars:

The *fiery minimis* striking down vehemently upon them, because they are screwed up more and more by the continual access of new coagulations impelled into the said Stars, must necessarily be intended in their force upon them for to recover their place and continuation: These then striking from all sides through those Celestial mixt bodies do expell, shake down, and effuse* continually great showers of those torrid *minimis* consisting of condensed fire, which are accelerated likewise in their descent through the depression of the air. These as they pass do heat the air, especially in the lower Region, because of the density of the clouds and air staying their beams. And 2. Because of their reflection from the earth.

These fiery showers do scarce reach any farther than the temperate Zones: Where they rain down perpendicularly there they leave marks of their heat; where obliquely, there of warmth only; but the air within the Polars is not sensible of so much as their warmth. These showers do fall down sometimes in a greater confluence than others, whence they cast a greater heat, which happens through their meeting and being united with more aerial matter or igneous clouds, or else through want of shelter under dense clouds in the air; or thirdly by uniting their showers with those of other Planets. Hence we may observe, That the Sun is the hottest body in the Heavens, and therefore the loosest and the softest. 2. That the Moon and the other Stars consist of a less soft consistency. 3. That the fixed Stars, as they do heat but little, so they dissolve but little, and therefore must be of a yet less soft consistency. 4. That the fiery clouds being supposed globous, and therefore profound, do harbour many invisible lights; whereof some do happen sometimes to be detruded out of their seat downwards (that is towards the earth) through the continued and exuberant force of the superiour parts of the Element of fire: This is seldom observed but in the lower Region of the fire, because that

Element

* Compare the generation of winds hereunto, for the manner is the same of both.

Element doth use its greatest force there, as being near to the place of its rise for its Center, and most pincht there by the obtruded igneous clouds. These new appearing Lights do sometimes keep within sight for eight or ten Months, some longer, others shorter, and afterwards disappear again, whence they come under the notion of Comets, agreeing in nothing with them except in their disappearing after a certain times lustre. The cause of their disappearance I impute to the bearing up of the air upwards by the inferiour fiery rayes, and carrying those dislocated Stars out of sight again, where they are included within a dense igneous cloud. 5. New Stars are oft generated within the bulk of the foresaid clouds, whose smallness and close inclusion doth render them invisible; Others again are dissolved through being over-powered by the force of the fiery Element. 6. The *Galaxia* or milky-way is nothing but a great number of small dusky lights or inequalities coagulated out of the grosser part of the peregrin Elements of the lower igneous Region.

* That is, is bound up by the continuous tenuity of the air.

VI. Lastly, Like as you see that the Element of water, which naturally consisteth of the greatest thickness, is reduced to that tenuity through such a great proportion of air, and that the air is from the greatest tenuity incrassated through such a quantity of water and earth into clouds throughout its whole body, even the same we must imagine of fire; viz. that it is reduced from the greatest rarity to a condensation and attenuation into large igneous clouds * throughout its body, through the vast admixture of air somewhat incrassated and condensed. These clouds in the lower Region are diducted and separated into many thick and profound ones; in the second Region into those of a great tenuity, but more cohering.

Thus we have briefly exposed to your view the commerce of fire with the other Elements, and for your better understanding have caused this Scheme to be inserted, where you have the universal flames striking downwards for a Center, whereas after the first knock it flamed upwards in the *Chaos*; because it moved from its own Center. The proportions of fire and air to both the other Elements, although not very exactly cut according to my Copy, yet comes near to it. The Stars are there represented according to their several Regions wherein they are seated. The motion of the heavens is likewise there exhibited as we have demonstrated it in the preceding Paragraphs; All which, with many others insisted upon in this and the subsequent Chapter, you have here plainly proposed.

CHAP.



A. Hertoch. sc.

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CHAP. XXII.

Of the Motion of the Element of fire.

1. *Where the Poles of the Heavens are.*
2. *The Opinions of Ptolomy and Tycho rejected.*
3. *That the Planets move freely and loosely, and why the fixed Stars are moved so uniformly.*
4. *The Suns retrograde motion unfolded, and the cause of it.*
5. *How the Ecliptick, Æquator, and the Zodiack were first found out.*
6. *The manner of the fiery Heavens their ventilation.*
7. *Whence it is, that the Sun moves swifter through the Austrinal Meridiet, and slower through the Boreal. How the Sun happens to measure a larger fiery Tract at some seasons in the same time than at others.*
8. *Whence the difference of the Suns greatest declination in the time of Hipparchus, Ptolomy, and of this our age happens.*
9. *An undoubted and exact way of Calculating the natural end of the World. The manner of the Worlds dissolution; The same proved also by the holy Scriptures. The prevention of a Calumny.*

I have formerly discoursed upon the motion of the Heavens from East to West, assigning the violent detention from their Center for the cause of it, I shall repeat nothing more of it than put you in mind that nothing can move circularly except upon two immoveable points, which are therefore named the *Poles* from sustaining their body. The immobility, which we observe in this our Hemisphere near the Bear Stars, perswades us to take it for the North or Arctick Pole, to which the South or Antartick Pole is opposite, visible only in the other Hemisphere. Between these the Heavens move from East to West, and where they measure most space, there they mark out the *Æquinoctial Line*, a greater Circle imagined or described by us to be in the Heavens equidistant from each Pole, that is, elevated above either of them 90 degrees.

II. Touching

II. Touching the motion of the Stars let us enquire, whether according to *Ptolomy* they are affixed to Orbs, and move along with them, or whether they move free and loose like Fish in the water, as *Tycho Brahe* conceived. It is strange to consider how the Ancients oft assumed false suppositions, builded for many Ages upon them, and retained them as Oracles: All this doubtless befell them through neglect of making further search and triall into their realities. What stupid fixions did they harbour touching the solidity of the Orbs, excusing the defect of their noise by their remoteness, imagining their harmony to be most pleasant to any Ear that could hear it. Their variety (were they not excused by being imaginary only) would exceed all probability of belief: Some they imagine to be *Concentrical* or *Excentrical*, which latter are either greater *Excentrical*, or lesser *excentrical*, alias *Epicycles*. Some again are both *Concentrical* & *Excentrical*, and others are *Concentrical* within a *Concentrical*. Some are *deferring*, others *equalizing*, and what not for to drive away their time? In *summa* they were at least 80 in number. Certainly no natural Philosopher can be adduced to believe these kinds of Fictions, knowing those bodies assigned for Orbs to be soft, and therefore unfit to cohere in so many Sections. But *Tycho Brahe's* dream is much more disagreeing, since it is impossible, that such loose bodies could move in such an exact and equal order, as the fixed Stars do; for otherwise were they loose, as Planets are, they would move as variously and disorderly as they.

III. Wherefore I conclude, 1. That the Planets, particularly the *Sun* and *Moon* do move freely and loose, being included within great fiery clouds, because their motions are very different one from the other, which otherwise could not be, supposing they were affixed to Orbs.

2. The *fixed Stars* cohere in large igneous clouds linked together, out of whose bodies they are constituted, and with them they are also moved: This their equal and regular motion makes clear to us. But I will take the pains to explain their motion to you more particularly, and begin with the *Sun*.

IV. The *Sun* we observe appears once in 24 hours to all the Inhabitants of the torrid and temperate Zones, being moved from East to West. I suppose you to remember and assume that maxime so oft repeated, *viz.* That no body whether mixt or single hath a power of moving it self locally to an external place, although from an

external place it may, so long as it obtaineth an internal Center. Whence I conclude, That the Sun doth not move through himself from East to West, but is carried along with the fiery Heavens, as a cloud with the air, or Ship with the flowing Ocean, and so they both happen to measure almost an equal space in an equal time, saving in one degree of time and space every day of a Tropical year, consisting of 360 Solar daies; which depends upon some resistency or renitency the Sun hath to external Local Motion or vection, like we observe in a Ship driving with the stream, yet not so fast as the stream, because there is some resistance in the Ship: whence it is apparent that the Sun is moved forward every natural day only 359 degrees, which occasioneth the Suns staying back one degree every day, whereby in 360 daies it must necessarily stay back the Circumference of the whole fiery Heavens; and hence it is, that the Sun doth appear to us every day one degree sooner or latter, as you may apprehend it. This staying back or retrograde motion Astronomers are pleased to call the proper motion of the Sun, whereby he moves through himself through the succession of the Signs, or against the motion of the *Primum mobile*; which is absurd, for then he must needs be an *Animal*; because only Animals can move to an external place through themselves.

This Retrogradation of the Sun is naturally directed from West towards East, but through the unequal access of cloudy fire daily driven up from one of the Poles spouting out strong showers of condensed fire, is shoven and driven every day somewhat to the side, viz. Northerly, when the said fiery clouds are impelled from the South side, which lasteth as long as untill that tract hath vented its burden, and cast it down towards the other side, and impelled the Sun to his greatest Northern declination, and by that time the Northern Hemisphere is so much filled with fiery clouds, that it is necessitated to vent it self through casting its condensed fire towards the South, whereby the Sun is impelled again to the other side. The way, described through the Suns being thus shoven from one side to the other, and yet gradually staying back from West to East, is called the *Ecliptick*, whose greatest declination towards either side North or South is distant from the *Equator* $23\frac{1}{2}$ degrees.

V. The Ancients observing the daily and monthly staying back of the Sun, in that he appeared now in such a declination or amplitude,

amplitude, a month after 30 degrees further, and the next month as many further, and so on, untill they had found out the Romb of the Sun, viz. The Ecliptick, phansied another Line much broader than this directly above among the stars of the Firmament, apprehending them all along that road, (to wit, through the Septentrional and Meridional declination,) so many as would constitute a twelfth part of the *Ecliptick*, to be like to some living creature or other, that so they might know them again; Hence they imagined one twelfth part of those Stars to be situated in such a position as to be like unto a Ram, wherefore they did all agree to name it *Aries*; the Stars next following this twelfth part to be like a Bull, whence they called that *Taurus*; and so on with the rest. Afterwards this whole Road was called by the name of *Zodiack*, from *ζῷον*, a living creature, as if they would have termed it a circle of living Creatures, that is like to them. So you see they did not pass through any great difficulty to make these observations and describe all the Circles of the heavens; for after they had once found out one Pole, they must needs have concluded there must be another: Then they could not but observe the firmament moving between these Poles; next that the middle must be the greatest course, and therefore a rule and measure of all other *Phænomena's*, which for that reason they called the *Aequator* or Equinoctial: Now having found out these three great marks for their guide, namely the Pole, Equinoctial, and the *Zodiack*, the other circles and observations of the motions of the Planets were easily made. This by the way.

VI. Before I go on any further, I will prove, that such a vast measure of fiery winds blows down from each of the Polar Regions for six months together. It is certain, That a great proportion of fiery clouds is cast from the middle or Equinoctial of the fiery Heavens towards the Poles, because there they are the strongest, as appears by their strong and swift motion, measuring more way by far there than about the Poles, wherefore the greatest part of those fiery clouds must necessarily be detrudd towards the Poles, as being the weaker parts of the heavens, and therefore the apter for their reception. These clouds being obruded thither in great quantities are compressed by the force of the Superiour heavens, whereby the condensed fiery *minims* break forth in great showers, which blowing constantly for six months do alwaies blow the Sun from them towards the opposite side.

* Witnesse the Mon-
suns. 2. If clouds of the air are most detrudd towards their Polars, and blow thence constantly for a long season *, as Mariners tell us they do; *Ergo* the same must happen in the fiery Region, since the efficient causes and materials are corresponding.

3. The fiery Region pressing strongly about the middle parts must needs cast up most air towards the Polars.

4. Before there can be an eruption of these fiery clouds, there must a certain abundance or proportion be collected, through whose over possession and exceeding swelling they may sooner give way to burst out; and then being opened they continue their fiery winds for six months, and by that time they are quite evacuated. In the mean time the other Polar side is a filling, and is just grown swell'd enough for to burst out against the other is exhausted.

Here may be objected, That whilst one Pole is evacuating, it should attract all the matter from the other Pole, because it gives way, whereas the other cannot.

I answer, That those fiery clouds through their giving way are still daily somewhat supplied by the continual casting up of the heavens; for otherwise their ventilation could hardly be so lasting; but however that * is sooner evacuated than the clouds can be shut up again, so that the ventilation lasteth untill all its contained matter is expelled.

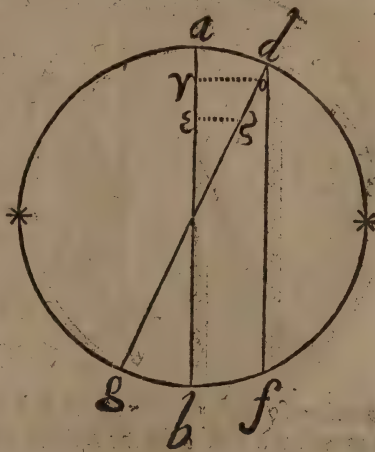
2. It is impossible that the air should be attracted from the opposite side, since the greatest force of the middle parts of the inferior Region is between, which screweth the matter up equally towards each Pole.

VII. The *Suns* deficient motion (that is, when he is accidentally moved through the succession of the Constellations of the *Zodiack*,) if compared to himself is observed to be regular; that is, in comparing one tropical or deficient course with another both do agree in the measure of space, being over-runned in an equal time, *viz.* of 360 Solar daies; and in an equal Velocity, moving in the same swiftness through the same Constellations in one year, that he doth in another. But if the particular motions of one defective or tropical course be referred to others of the same annual motion, we shall find that the Sun is more potently withheld under the Meridional Signs than under the Septentrional ones: That is, moves swifter through the Austral Mediety in the Winter, consuming but 178 daies 21 hours and 12 minut. in that peragrati-
and

and flower through the Boreal Signs in the Summer, spending 186 daies 8 hours 12 minutes (computing with the Vulgar 365 daies, 5 hours, 49 min. 16 sec. in the year,) so that the difference is 7 daies and 12 hours.

2. The *Sun* appears sometimes at some seasons of the year higher then at others, that is, sometimes nearer to us, and other times farther from us; or otherwise the *Sun* is at the highest and farthest in the Summer in the month of *June*, being then in *Cancer*, and at the lowest or nearest in the moneth of *December*, being then in *Capricorn*.

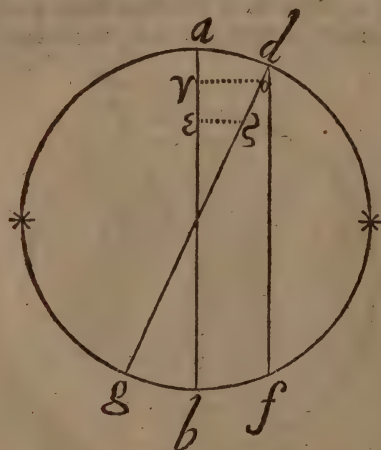
Touching the former of these properties, whether the said Velocity be real, or a Phenomenon only; Or whether if supposed real or a Phenomenon, the same doth appear alike to our Southern *Antipodes*; or whether on the contrary the *Sun* doth not appear to them to stay longer in the Southern Mediety, and shorter in the Northern; and whether the inhabitants directly under the Equator do apprehend the same that we do, may be justly doubted. If the observation of the Southern *Antipodes* agree with ours, then we must conclude the extent of motion to be real, and the Sun to stay away longer in one Mediety then in another; but if otherwise, and that those under the Equinoctial do observe no longer stay of the Sun on one side than on another, then it is only apparent & to be imputed to a hallucination & refraction. But the former is more probable, whose cause must be referred to the slowness of eruption of the arctic fiery shows, and therefore is not so soon or potentially impelled from that Mediety. 3. The Sun when harbouring in the Equinox moves through a greater space in the same time then when deflecting thence, and the more deflecting the less space he measures in the same time; because then he follows the course of the Equinoctial, (supposing the Sun in *a*) whose Diameter *ab* must needs be



longer.

longer than from $d f$, when the Sun existing in d (suppose him then to be in his greatest declination) moves in the same time to f . Or otherwise the higher the Sun appears, the more way he makes in the same time; but he is higher in a than in d , and therefore makes more way. The reason, why the Sun appears higher to us in the Summer, is, because he approaches nearer to our *Zenith*, and thence we say he is higher, because a thing that is over our heads seems to be higher than that which is remote from us, although the Sun being then compared to the Center of the Terrestrial Globe is not higher than he was when he was most remote from us.

VIII. The greatest declination of the Sun hath formerly in the daies of *Hipparchus* & *Ptolomy* been observed to be of 23 deg. 52 mi. which according to *Copernicus* his observation is reduced to 30 min. by others since to 28. The cause is evident, and is to be imputed to the Suns, or rather the fiery Regions gaining upon the inferiour Elements; namely, the water gains upon the earth, and diducts her mole, the air gains upon them both and insufflates their bodies, and lastly the fire gains upon the air, through which means it must necessarily incline nearer to the Center of the Earth, which approximation must cause a diminution of the Suns declination: For instance, suppose the Sun in *Hipparchus* his time to have been at the height of



a , being then in his greatest declination from the Equinoctial $a b$; if then since through the fiery Regions having gained upon the other Elements, the Sun is descended from a to g , being there nearer to the Center of the Earth, his greatest declination in g must needs be less to a than it is from a to g .

IX. Hence we may easily collect the duration of the World thus: If the fiery Region hath gained from the time or years of *Ptolomy* to

Copernicus so many minutes of the other Elements, in how many years will the fire gain the restant minutes? This being found out by

by the rule of proportion will resolve us, when the World shall be returned again into a confusion or *Chaos*; so that you may observe, as at the beginning of the world the weighty Elements did gradually expell, and at last over-power the light ones, so the light ones do now gradually gain upon the weighty ones, and at last will again over-power them: and so you have a description of the long year consisting of 20 thousand Solar Circuits, gaining near a degree every 68 years, but towards the latter end will prevail much more, because the nearer they incline the more forcibly they will make way.

And so you see all things are like to return to what they were, viz. The immortal souls of men to God, and the Universe into the same *Chaos*; which as I said formerly will abide a *Chaos* to all Eternity, unless God do divide it again into a new World, and raise new Bodies for the Souls that have of long been in being. At the latter end of this descent you shall have *Christ* descending in the greatest Triumph, Glory, and Splendor, appearing in a body brighter than the Sun: Here must needs happen a very great noise and thunder, when the Elements do with the greatest force clash against one another, which cannot but then strike the greatest amazement and anguish into the Ears of the Wicked. This Doctrine may prove a plain Paraphrase upon those mysteries mentioned in the *Revelation* of St. *John*: For instance *Chap. 9. v. 1, 2.* where a Star is described to fall down from heaven, namely the Sun; opening the bottomless pit and raising a smok, viz. through his burning and consuming rayes, &c.

No wonder if mens fancies are so strongly misled in constructing the obscurities of the late quoted Book of Divine Predictions; some imagining a plenary abolition of the Elements, others their conversion into a hell for the damned; some thence deducting *Christs* Personal Reign before the consummation of the World, others judging quite contrary; what strange phanatick deductions and constructions do some Spirits suggest to themselves, expecting every moment a subversion of the world! and alas God hath ordained the World to run out its natural course, which doubtless He will in no wise contradict; and how long that is like to last may be infallibly proposed from what I have here stated, where we cannot but note that all those depravate conceptions do derive from mens ignorance in Philosophy and Nature, Gods great work.

G g g g g

But

But me thinks I see some ready to condemn me for stating assertions touching things of the Divine Purpose, and such as God hath reserved within himself; and therefore none ought to dive into those secret Counsels.

I answer, That we are to make a search into all things as far as our parts will bear us out in, and we are commanded so to do; because we may the more admire God in all his Attributes.

2. God hath given a man power of searching into all intelligible things, and therefore ought to make the greatest use of it he can.

3. It is impossible for man, so much as to make an attempt to search into Gods Secrets, because God hath limited him with a finite power: So that there is little fear that any should search into any such mysteries. But this by the way.

CHAP. XXIII.

Of the Magnitude and distance of the Sun and Moon, and the motion of the other Planets.

1. That the Magnitude of the Sun hath not been probably, much less certainly, stated by any. The Arguments, vulgarly proffered for the proof of the Suns Magnitude, rejected.
2. That the Sun might be capable enough of illuminating the World were he much lesser than the terraqueous Globe than I suppose him to be.
3. That the shadow of the Earth is to some extent Cylindrical.
4. That the Sun existing in the Equator doth at once illuminate the whole Hemisphere of the Earth.
5. Concerning the diminution or increase of the shadow of the Earth within the Polars, together with the cause of the Prolongation and Abbreviation of the daies. That the Sun is much bigger than he appears to be.
6. What the spots of the Sun and Moon are, and their causes.
7. That the Arguments, proposed by Astronomers for rendring the Moon lesser than the Earth, and proving the distance of the Sun, are invalid.
8. That the Moon is by far lesser than the Earth.

9. Several

9. *Several Phenomena's of the Moon demonstrated.*

10. *Concerning the motion of Venus and Mercury.*

11. *Of the motion of the fixed Stars, and their Scintillation.*

I. **T**He body of the Sun is by far exceeded in mole and bigness by the weighty Globe; but before I insilt upon the proof of this, I will repeat the Arguments produced by those, who assert the Sun to be many times bigger than the said Globe.

In the first place I must take notice of the great variance, which there is between those great *Coryphaans* in Astronomy touching the Magnitude of Stars, many of them differing from each other in their compute 10, 12, or more Diameters of the Earth, which is accounted but a slight disagreeance. Now if these Grandees are disagreeing from one another in so many thousand Leagues in defining the Magnitude of a Star, what shall we judge of their most certain (as they pretend) demonstrations?

2. Let us examine their Instruments, whereby they aspire to fix the body of a Star; such are an *Astrolabe*, *Semicircle*, *Quadrant*, &c. These being divided according to the proportion of 360 degr. contained in a Celestial Orb, are well enough fitted to explain the number of such degrees, but then the difficulty remains the same still, *viz.* What proportion a degree of Longitude in the Heavens bears to any certain known Longitude of the Earth. Neither are they wanting in this, asserting a degree of Longitude of the Solar Orb to be equal to 15 German Leagues; because the Sun doth remove the shadow of 15 Leagues from the Earth through the progress of each degree. But suppose this were granted, it followeth that a degree of Longitude of the Solar Orb is equal to a degree of Longitude of the Firmament; because the Firmament doth likewise make 15 Leagues by its gradual progress, or how could it absolve its diurnal circuit in 24 hours? but this is false: So neither doth the Sun's removal of the shadow from the Earth infer the said proportion: because the Sun (according to their Supposition,) far exceeding the earth in bigness, cannot describe a true and equal Longitude of its progress upon the Earth, but only his light being terminated by the Earth is alone denoted to vary its termination so many Leagues by moving one degree.

3. If Astronomers do vary so much from one another in assigning the Earths Longitude, whereunto we are so near, we have

Ggggg 2 *the greater*

greater reason to suspect their conclusions of the Stars their mensuration (which are so remote from us) to be void of all foundation. *Aristotle* pronounced the Circumference of the Terrestrial Globe to contain 50000 miles, assigning $138\frac{8}{9}$ miles to every degree. *Hipparchus* allowed 34625 miles responding in $96\frac{1}{2}$ miles to every degree. *Eratosthenes* stated 31500 miles, allowing $87\frac{1}{2}$ miles to a degree. *Ptolomy* granted 22500. *Alphraganus* 20400. *Fernelius* 24514. Others who have sailed about it state 190010 miles for the Circumference of the Earth. Judge what a vast difference there is between them!

4. Another Argument proposed by them is, because the Sun's absence or opposition to us effects a conical shadow or darkness; *Ergo* the Sun must be greater than the Earth. But how can the shadow be conical, since it drowns the Moon (whose Diameter according to their own confession contains a 39th part of the Diameter of the earth) which extends to a greater largeness than a Conical Figure should do?

2. Were the shadow of the Earth Cylindrical, then they would confess the Sun to be of an equal bigness with the earth; but that, they say, it is not; *ergo*. I deny the *Minor*, and prove the contrary. The Sun existing in either of the equinoctial points makes day and night equal the whole earth over; *ergo* the shadow of the earth must be columnal, because the obversed surface of the earth doth clip or stop the light from the other opposite surface to the extent of half the globe. Wherefore the terraqueous shadow of the one side of the earth, being equal to the light of the other side, must needs be columnal. And although this columnal shadow is not extended further than above half way to the Region of the fierie element, where it beginneth to be contracted and gradually diminished, yet that hinders not, but that the said shadow may be columnal to some certain extent. If now the said shadow were conical, then the Sun at once must illustrate more then the mediety of the Globe, and consequently the nights would be shorter then the daies, although under the Line at the season of the Equinoxe; but that is false; *ergo*. Again, were the Sun greater than the Earth, *ergo* its heat would be communicated in an equal violence upon all the parts of it; for why should it not as much powr out showers of heat conically, as you say it doth its light? Here you cannot accure to excuse your self by the distance or remoteness of the Sun, thence contracting its heat; for then it must likewise contract its light. 3. They

3. They assert, supposing the shadow of the Earth to be conical, that therefore the Sun must be necessarily greater. But for what reason? Not because the *Sun* is greater, but because the light is larger: wherefore the largeness of the light doth not conclude any thing touching the bigness of the Sun. Is not the light of a Candle or Torch much larger than its flame? Is not the same Candle apt to overcast an Object much bigger than it self with light that shall exceed its mediety? and consequently the shadow of such a body must be conical. Whence it is, that a body ten thousand times less than the air, is capable of illuminating its whole tract, because a body of that proportion is big enough to obrend the air throughout its whole depth. But if you should imagine with the *Peripateticks*, that light is efficiently produced by the lucid substance of the Sun (I know not how,) then indeed the body of the Sun must be many times bigger than the earth, because the *Lumen* would be but just of the same extent with the *Lux*. But I need not to answer to this, since the contrary hath been plainly proved. After all this, I state,

II. 1. That the Sun, were he so much lesser than the terraqueous globe, than I suppose he is, would be big enough to illuminate its whole Hemisphere at once; for if the light of a Candle doth illuminate the air thirty leagues round, much more would the Sun the whole Hemisphere, whose substance is by far more pure, lucid, and bigger in that proportion in comparison with the aerial region, then a focal light being of an impure, dark substance, is in comparison to the Circumference of 30 Leagues.

II. 2. The shadow of the earth is to some extent cylindrical. I prove it; Is not the shadow of a man standing in the Sun cylindrical to some extent? Is not the shadow of a Pen or other small body, being held at some distance* before a Candle (whose *Lux* is bigger than the body objected) cylindrical to some extent? Besides, as I proved above, it is evident in the Equinoxes: The reason is, because a dense body doth obscure and dead the light as far as it is dense; now the earth being dense all about the entire Horizon, no wonder if it doth dead and obscure the Sun's light to the extent of its Hemisphere.

* Other-
wise if held
near to it,
it is conical.

IV. 3. The Sun existing in the Equinoctial, doth at once illuminate the whole Hemisphere of the earth from one Pole to the other. If the Sun existing in the *Meridian*, is seen at once by those under the tor-
rid

rid Zone from the Ascension of the Equator, that are 90 degrees off Eastward, and as many Westward from its Descension; then the Sun must also be seen as many degr. off to the Southward as to the Northward, that is to each Pole, because the Sun being globous, doth obtend the air equally about to all the parts of the Compass. But the Sun in the *Meridian* is seen at one time by those that are 90 degr. Eastward or Westward; *ergo*.

V. 4. By so many degrees as the Sun declineth to the North, by so many degrees doth a perfect shadow or darkness cover the South polar Earth; and the like conceive of the South Declination.

5. The Suns gradual declination causes a prolongation or abbreviation of its diurnal light and shadow, or the equality and inequality of the daies and nights.

6. The Sun is much greater than he appeares to be, because the clouds and depth of the air do diminish its *species*, in the manner of a great fire appearing but like a small spark at a great distance. Astronomers are not only forward in prescribing the bigness of the Stars, but also their distances; And how is that possible, since they cannot sensibly demonstrate the *Diameter* of the World, or define any certain extent in the Heavens for to compare another Terrestrial length unto? neither can they ever find out an exact account of any length upon the Earth responding to a degree of any of the Orbs of Heaven: If so, what do all their observations touching the Stars *Parallaxis* amount unto?

VI. The body of the *Sun* is usually expressed as resembling a mans face, whose Marks and Signatures are nothing else but certain protuberancies and spots; The like is apparent in the Moons face. These protuberancies are nothing but inequalities of their cloudy bodies appearing like unto clouds in the air, thicker or more compact in one place, and thinner and looser in another. The *Telescopium* or Prospective Glasse discerns those spots to be moveable: and not unlikely, since they, being the external parts of those gross and looser clouds, are apt to be displaced and change their situation through the obstruction befalling them by the most rapid motion of the Heavens. These do sometimes increase and accrease either through dispersion or apposition of new clouds floating here and there in the Planets their way as they move, which oft causes a distinction of their bigger or lesser appearance at some times than at others.

VII. The

VII. The Moon is by all Astronomers believed to be less than the terrestrial globe, because the shadow of the eclipse of the Sun is much too little to obtrunche all the Earth. But supposing the Sun to be of so inapparent a bigness and distance from the Earth as the vulgar of Astronomers do receive him to be of, and the Moon to be of a far greater distance from the Earth than she is, certainly the shadow, which she would cast must be much less than her body, although it were forty times bigger than it is, because the Sun being greater than she must according to the ordinary Doctrine of shadows only suffer her to cast a conical shadow, whose extreme point not reaching to the Earth, or if it did, could not be a certain token, whence to draw the proportion or distance of Stars. Wherefore according to their own principles, the Moon may be conceived to exceed the Earth far in bigness, since they cannot attain to any probable account of the distances of the Stars.

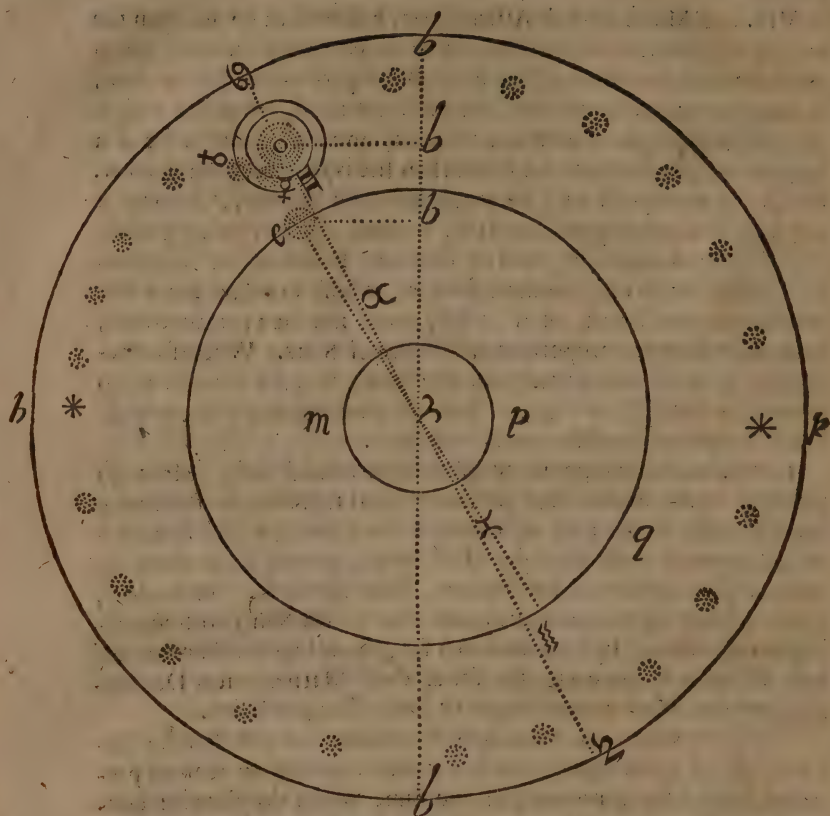
2. We must also suppose the *Moon* to be a lucid body, (although yielding to the Sun in that particular) and therefore to illuminate the Earth somewhat; for otherwise in every total perfect Eclipse it would prove as dark as pitch; if so, what ground doth there remain to take measure of her shadow, since her light, (or shadow, that is a lesser light in comparison to that of the Sun) doth according to our rule of light extend to a far greater bigness than her self is? Whence it appears, that for all their Mathematical Demonstrations the *Moon* may be bigger or lesser than the Earth.

VIII. However the *Moon* is by far lesser than the Earth; because of its small light, which it casteth, and other reasons produced from the minorating of the Sun, which do likewise conclude the *Moon* to be lesser than the Sun, but bigger than any of the other Stars. The *Moon* is the lowest of all the Stars; because she is the least lucid of any, and consequently must be most terrestrial and aqueous, through which principles she must doubtless yield to be lowest depressed by the fiery Region, in that manner as I have formerly set down.

2. Because she moves the quickest (or in another sense the slowest, as you may read before) through the *Zodiack*; which must needs suppose the Circumference of her Circuit to be the least.

3. Because she cannot be seen, unless at a nearer distance than the others may.

IX. The



IX. The Moon through her diurnal course from East to West resolves no more than 346 deg. 49 min. 24 sec. 58 third. 52 four. 38 fif. that is, is so much retarded *, or is moved so much slower than the fiery Region: So that in 27 daies, 7 hours, 43 min. 5 sec. 8 th. she is retarded 360 deg. or the extent of a whole Circle. She is in the same manner, as we have proposed concerning the Sun, shewed from North to South, and from South back to North a degree and some minutes every day, her greatest declination being 28. deg. 30 min. and her greatest Latitude 5 degrees. But you must not apprehend, although I say, that the *Moon* is removed from the *Ecliptick* 5 deg. that therefore she is seated 5 degrees beyond the Sun, notwithstanding her greatest digression from the *Ecliptick*, yet

* viz. as there are
restant deg.
from 346
deg. 49 min.
&c. to 360
degr.

yet she is and appears nearer to the Equinoctial *bbbb* than he: Suppose one standing upon the surface of the Earth any where between *m* and *p*; I say that the Moon existing in the Merid. *eq*, and in her greatest Latitude near *e*, viz. from the Ecliptick, is and appears nearer to the Equinoctial *bbbb*, than the Sun doth in *o*, because the Line from *o* to *b* is longer, than from the Center of the Moon near *e* to *b*. Whence you may conceive, that the Moon is nearer to the Equinoctial, although seated beyond the Ecliptick.

2. That the degrees of the Orb of the Moon are so much less proportionally, as the Orb of the Moon is less than the Orb of the Sun. But to pursue the Moons Motion into Latitude: Star-Gazers do observe her to appear sometimes higher and lower in her *Perigæo* and *Apogæo*; Not because of her *Epicycle*, but because of the Aspect of the Sun, which doth sometimes reflect its light stronger upon her, and so makes her to seem higher *, besides the *medium* of the air being by means of that Aspect so attenuated †, it must needs produce a prolongation of the object, like to a thin Glass representing the object to be much farther distant than it is. As the said attenuation renders an object more distant, so it renders it also less, whence it is that the Moon appears lesser in her prolongation. That she moveth swifter sometimes than other times is likewise a meer appearance, hapning through the extension and prolongation of the object and *Medium*: So on the contrary the incrassation of the air through the remoteness of the Sun causeth the Moon to seem to move slower, and to be bigger and nearer; as when she is in her *Perigæo*. The same hapneth, when we see through a thick Glass, or in looking upon an object through the water. seeming nearer and bigger, and to move slower. I am not to describe you here the meaning of Solar and Lunar Eclipses, alone the cause of their variation: viz. depending upon the difference of declination in the Sun, and of declination and latitude in the Moon; for he being constantly in making his progress cannot be ever met or overtaken by the Moon at the same place and time.

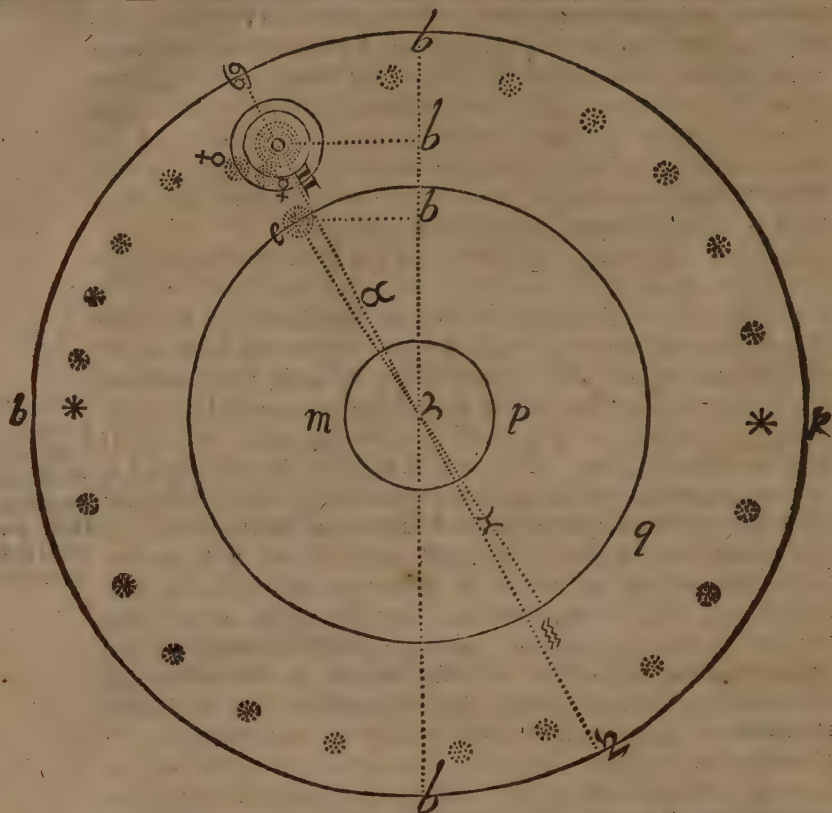
X. *Venus* and *Mercury* are the two Pages of the Sun, neither of them being much distant from him. Both are much wanting in bigness of the Moon. Their motion from West to East is near upon the same with that of the Sun. And so is their motion into Latitude depending likewise upon the same impelling cause, only they are observed to wheel round about the Sun: to wit, *Mercury* in the space of three months, and *Venus* within eight, in the manner represented within the apposed Scheme. Their impulse about the Sun is thus; The Sun casting its fiery rayes round like to a

H h h h

Squib,

* That is, remoter.

† But accidentally, by expelling those vapours that incrassate it.



squib, raises and commotes all the fiery clouds about him, which reaching in a greater force to those that are nearer adjacent, must needs cause a swifter circulation, than to those of a more remote distance; whence it is, that *Mercury* absolves his circular course about the Sun in a less time by far than *Venus*.

I shall spend no more time in discoursing upon the motion of the three superiour Planets, since their motion and manner of it may easily be apprehended by what hath been proposed.

XI. What concerns the constant, equal, and ranked motion of the fixed Stars, it is to be attributed to the cohesion or linking of those equal large clouds of the second Region of fire, wherein the said Lights are fixed, moving them equally and constantly in that fixation.

Their Scintillation is nothing else but their flames quivering upon the obtended air, hapning through their recurrent motion, or quivering accurs to one anot her.

An



AN APPENDIX

Of Problems resolved by our
Principles.

CHAP. I.

Problems relating to the Earth.

1. *Why two weighty bodies are not moved downwards in parallel Lines.*
2. *Why a great Stone is more difficultly moved on the top of a high hill than below.*
3. *Why a pair of Scales is easier moved empty than ballanced.*
4. *Whence it is that a man may carry a greater weight upon a Wheelbarrow than upon his back.*
5. *Why a weighty body is easier thrust forward with a Pole, than immediately by ones arms: besides 5 other Probl. more.*
6. *Why a stick thrust into a hole if bended is apt to be broke near the hole. What the cause of the relaxation of a bowed stick is.*
7. *Whether Gold doth attract Mercury.*

H h h h h 2

8. *Why*

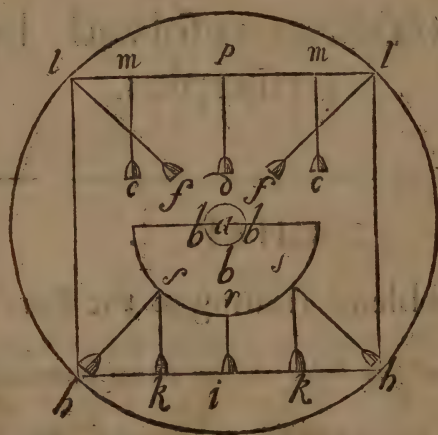
8. *Why the herb of the Sun, vulgarly called Chrysanthemum Peruvianum, obverteth its leaves and flowers to the Sun wheresoever he be.*
 9. *Why the Laurel is seldom or never stricken by Lightning.*

I.



Why are not two or more weights depressed down to the Earth in parallel lines, but in stead thereof come nearer and nearer to one another the lower they descend?

Ans. Because all weighty bodies are depressed downwards by the sinking down of the air for its center, which tending directly from the Circumference thither, doth also direct the said weights to the same *terminus ad quem*; thus, Suppose three Plummetts to hang down from *l p l*, their motion would not be di-



rected in parallel Lines in the manner as from *m p m* to *c d c*, but would tend to *f d f*, and being let down lower would all meet at the Center (imagine of the terraqueous Globe *d b b b*) *a*, because of the said motion of the air. Likewise supposing three light bodies to be moved upwards from *s r s*, they would not be parallelly moved to *k i k*, but from *s r s* towards the Circumference to *h i h*, Because the motion of the air tends directly from the Center to the Circumference.

II. I.

II. It is confirmed by many trials, that a great stone is more difficultly moved on the plain of the top of a high hill, than on the plain of a low level ground; And that a great mass of any Mineral may be easier rouled out of its place deep in the Mines by one, than by three or four on the Surface of the earth. You demand the reason.

I answer, That the air being more forcible (as we have shewed before) on the tops of hills, doth more potently depresse the stone against the plain of the hill, and so detains it there; no wonder then if it prove so slow in motion. Likewise is the air of a greater energy on the Surface than deep under the earth, where it is discontinued by weighty *minims* forced out of the earths bowels in expelling the perigrin air, whose contiguous depression (to wit of the air, being discontinued by the said weighty *minims*) doth also contribute much to the rouling of a Mineral, because we roul a weighty body by depressing it against the ground, in which action our force is not only strengthned, but the weighty body is also impelled forward (but by *refraction*) by the aid of the said weighty *minims*.

Here you may reply, That the air doth also depress the body downwards, and consequently detain it.

I answer, (Besides what I have stated in the Solution of the six Problems at the 3 Art.) that as far as the air is continuous, and so depresseth a body, it doth detain it within its continuity, but being rendred contiguous by the discontinuating weighty *minims* grants passage to any impelled body. The first part of the Solution is apparent in drawing any weighty body under water through it, where you may perceive a very forcible detention by reason of the continuity of the parts of the water; the latter in drawing it through fire. What concerns Dr. Gilberts Magnetick *Effluvia*, & Monsieur Gasendys his rigid *Cords or Hooks*, which are by some borrowed to explain the differences of intention of Gravity, are futile, since they are only pulled out of their Phantasies without any probable proof for either.

III. The precedent Solution may also be applied to this Problem, viz. Why a pair of Scales are easier moved being empty, than when balanced by equal weights.

IV. Whence is it, that a man may carry a greater weight upon a Wheelbarrow than upon his back?

Answer..

I answer, Because in carrying a weight upon a Wheelbarrow he only thrusts it forward, and is assisted by the contiguous pressure of the air, qualified as we have proposed in the 2 Problem.

2. Because the Wheel being circular is easily propelled. A circular body is easier propelled, because it is thrust forward upon single points, which it is certain yield obedience with the least resistance to the force impelling.

3. Because of the reason of the first Problem.

V. A man impelling a weighty body from him, shall easier impel it by making use of a Pole to thrust it forwards, than if he tumbled it along with his arms only; whence it is, that they usually affix a long Iron handle to those great rolling stones, that are used in Gardens for to even the ground.

2. One shall cast a stone further with a sling, than without it.

3. Likewise a stroke given with a hammer with a long handle, is much more forcible, than if made by one with a short handle; or striking with a long handled hammer, the stroke shall be of a greater force if held by the farther end of it, than if otherwise taken hold nearer to the hammer.

4. A cuff given with a swing of ones arm, makes by far a greater impression than a thump.

* To wit,
from the
knee.

5. A stick is easier broken upon ones knee the farther the hands are removed from it*; and the harder, the nearer they are applied.

6. The longer an Oar is, the swifter the vection of the Boat is, although impelled with the same force that a shorter may be. All these being Problematically proposed are resolved by one and the same answer: viz. Supposing the air to press so potently downwards, I say, that it being shoven and elevated before at the body propelled, (supposing it also to be continuous, and consequently not complicable, that is contiguously introceding, as I have told you before,) is forced to rise up, and to sink down again behind at the place, out of which it was propelled but the instant before, where through that violent and most swift descent and refraction against the body of the *Propulsor* and of the backward air, must needs shove hard between the body propelled, and the propulsor, and backward air, and so by that means must add a great force to the impulse of the said weighty body.

Thus,



Thus, suppose this round stone to be impelled from *ddd* into *aaa*, doubtless that air, now dispossessed of *aaa* must be risen up into *bbb*, and sink or shove down refracted into *ddd* and *eee*, to wit, between the *Impulsor* and back air *ffff*, and between the *Impulsor* and the stone, which must necessarily superadd to the impulse of the *Impulsor* at *ddd*, and add no less to the intending of the strength of the *propulsor* at *eee*, impelling the said *propulsor* much stronger forward, than his own or animal force could move him: Which hath oft occasioned me to conclude with my self, that the strength or swiftness of a man, in impelling or running without the supposed assistance and impulse of the air, is at least one third or more less than it seemeth; because he can scarce sustain



two thirds of that weight upon his back or less, that he can drive forward. This resolves us, why a man or a horse cannot stay themselves in their full course or running; because the air being in a commotion, doth not desist from impelling the said running bodies forwards, before it is gradually reduced to a remission and rest from that violent motion.

This premittid I say, 2. That the more or the greater body of air is moved by the greater or longer impelled body, the stronger, swifter, and easier the said greater or longer body must be impelled. Hence we must also deduce the reason, why a body being already in motion, is easier moved forwards, than one that is at rest.

3. I say

3. I say that a Globous Body is easiest impelled, because the Air meeting with no resistance or stay by Angles, slides quicker over it, and consequently driveth the faster: besides an angular Body having many plain sides, (breaking the force of the Air,) doth not force the air so much as a globous body, that inverting the air quite contrary into a circular Figure upwards, (whereas naturally it striveth in a circular Figure downwards,) whereby the Air is much irritated and intended in its force. Why an angular Body resisteth an impulse stronger, is, because the Air in depressing downwards takes faster hold of it in pressing upon its Plane, being thereby and its angles hindered or cut off from sliding off, as appears in the quadrangular stone exhibited in this apposed Scheme, where you may plainly see the difference of the figures of the air in its elevation by bodies of various figures.

Here may be objected against these subconclusions, that the air, were it of that force, as to superadd so much to the *impulsor* and *impulse*, would evidently press down the loose Coat of the driver, and be plainly felt by him. Touching the force of the air, no doubt but it is very great, according to the commotion and irritation thereof, as appears in expelling the flame out of a Gun; in bursting thick Glass bottels, &c. 2. It doth not press down the loose garments of the *impulsor*, because they are supported by air underneath, and being very pervious, and therefore not resisting gives passage to their meeting. 3. Its force is not felt, because it is equal and presseth the *propulsor* forward with a gradual, equal and smooth force.

VI. Why is a Stick being thrust some part of it into a Hole apter to be broke near the Hole, if bended, than any where else?

I Answer, that through the bending of the Stick, the moveable parts of it, *viz.* the air, water and fire that are perfused within throughout its Pores, are compressed towards the other end, where being stopt through the compression of the sides of the Hole, do tumefie the Stick there, whereby together with the continuation of the force bending it is disrupted. The said Spirits recurring in a Stick bowed only, and not broken, cause the relaxation of the inflexion, forcing the solid parts of the Stick into their pristine position by their return.

VII. Whether Gold doth attract *Mercury*?

Ans^r. The Vulgar imagineth it to be so; because a piece of
 Iiiii Gold

Gold being held in a Patients Mouth, that is a salivating, or lately hath salivated by *Mercurials*, is changed white through its attracting the *Mercury*. But how should it attract; by its Volatick Spirits possibly? No certainly; for the whole Rabble of Chymical *Vulcans* finds its Spirits to be fixed beyond those of all other Bodies. How then? Not by acting a *distanti*; Ergo it is fallacious, that Gold attracts *Mercury*, and more probable, that the spirits of *Mercury* being ordinarily termed fugitive, cannot be coagulated or collected, but by the denselt body, whence it is that only Gold doth collect and coagulate its spirits about its Surface.

VIII. Why doth the *Herb of the Sun* vulgarly called *Chrysanthemum Peruvianum*, or Crowfoot of Peru, (because its Leaves and Flowers resemble those of our Crowfoot) turn the faces of its Leaves and Flowers about with the Sun?

Answ. Because the Sun through its igneous Beames doth rarefie that side of the Leaves and Flowers which is obverted to it, whereby he doth expel their continuous streames, whose egress doth attract or incline them that way whither they are expelled, in the same manner as we have explained the Attraction of the Loadstone.

IX. Why is the Laurel seldom or never struck by Lightning?

Answ. Because it is circumvested with a thick slimy Moysture, which doth easily shove or slide off the Glance of a Lightning.

CHAP. II.

Containing Problemes relating to Water.

1. Why is red hot Iron rendered harder by being quencht in cold water?
2. Whence is it there falls a kind of small Rain every day at noon under the Equinoctial Region?
3. How Glass is made.
4. Whence it is that so great a Mole as a Ship yields to be turned by so small a thing as her Rudder.
5. What the cause of a Ships swimming upon the water is.
6. Whether all hard waterish bodies are freed from fire.

I. **VV**hy is red hot Iron rendered harder by being quencht in cold water? *Answ.*

Ans. Because the water doth suddenly pierce into the Pores of iron, being now open, and violently expel the fire and air, (both which, as we have shewed in *B. 1. Part 2.* are the sole Causes of the softness of a body,) and being expelled, leave the same indurated by the weighty Elements pressing more forcibly and harder to their Center.

II. Whence is it, that there falls a kind of small Rain every day from 11 or 12 of the Clock to 2 or 3 in the Afternoon, under the *Æquinoctial Region*?

Ans. The Sun at his Rising and Descending, doth through his oblique Rayes excite a multitude of small vapours, which through the privative coldness of the air in the night are concreated into small clouds, but reduced into drops of rain through the Suns rarefaction or fiery *minims* when he is perpendicularly imminent upon them.

III. How is Glass made?

Ans. The matter of ordinary Glass is generally known to be Ashes, or Chalk burnt out of stones, or both.

The *Venice Glasses*, differing from others in clearness and transparency, are made out of chalk burnt out of stones, which they fetch from *Pavia* by the River *Ficinum*, and the ashes of the weed *Kall*, growing in the deserts of *Arabia* between *Alexandria* and *Rossetta*, which the *Arabians* make use of for fuel. In the first Book, second Part, I have told you, how a body was reduced into ashes through the expulsion of its thinner glutinous moisture by the vibrating fiery *minims*. The same fire being intended doth through its greater violence enter, mollifie, diduct, and thence melt and equalize the courser thick remaining glutinous moisture by its own presence together with the air, which it imports along with it, whereby the Terrestrial *minims*, that were before clotted, are exactly and equally spread throughout the foresaid thick glutinous moisture. The fire and air being only admitted from without, & not incorporated with the said bodies through want of a *matrix*, & because they being in that extream overpowering quantity, that they may as easily free themselves from the said body, as they entered, are expelled again as soon as they are exposed to the cold ambient air, and so desert the body, leaving it glib, smooth, continuously hard, friable, rigid, and transparent. So that it appears hence, that Glass is nothing but water reduced nearer to its abso-

lute nature, (which we have shewed is hard and clear,) by freeing it from the thin glutinous moisture (or air and fire incorporated with a small proportion of water) through burning its first subject into ashes, and afterwards by uniting, diducting, and equallizing its own parts contained in the ashes. By the fore-mentioned thick or coarse glutinous moisture I intend a mixture of much water incorporated with a little earth, and least air and fire. That Glas is water nearer reduced to its absolute nature I shall prove by its properties.

1. That glib smoothness of Glas depends upon the continuity of the parts of water, necessarily accompanied by a glib smoothness, because it doth not consist of any contiguous rough *minims*.

2. It is continuously hard, because water of her absolute nature is continuously hard.

3. It is friable, because the water is throughout divided by the *minims of earth*, which render it so brittle and rigid; whereas were it all water, it would be harder than any stone: It is transparent, because it is but little condensed by earth, whose condensation renders all bodies obscure.

2. Because it is luminous, that is, apt to receive the *lumen* from any lucid body, as being throughout porous, through which it is rendred capable of harbouring the *obteded air*.

Glas is distinguished from Crystallin hardness and transparency, because this latter appropriates more of water in her absolute state, and less of earth.

IV. Whence is it, that so great a mole as a Ship yields so readily in turning or winding to so small a thing as a Rudder? This Problem will make plain, that an impulse is intended by a *medium*, or *deferens*.

A Ship swimming in the water, and being impelled by the wind or a board-hook, raiseth the water into a tumour before at her bowes, which is violently impelled, what by the air lifted up by the tumour, what by her own bent to recover that place behind at the stern, whence it was first propelled, (and where you shall alwaies observe a hollownes in the water, proportionable to her rising before,) and therefore, as you may see, runs swiftly about both the sides, and meeting in both the streams abaft doth propel the Ship forward by a reflection; and this you may also perceive in taking

taking notice of that most eager meeting of the streams of water from both sides behind at the Rudder, which being removed to either side, *viz.* To *Star-board*, or *Lar-board* side, directs the Ship towards the sides; because the force of the water in returning doth beat hard against that side of the Rudder, which is obverted to her, as resisting most and collecting her force is shoved towards the opposite side of the Stern, whereby her head comes too to the other side; whence we may plainly observe, that a Ship doth not begin to turn before, but alwaies abaft. This I prove, A Ship hitting her breech against the ground at Sea usually striketh abaft, because she draweth more water there than before; now the shoving of the Helm to the other side brings her off immediately, and brings her head too; which is a certain sign, that a Ship is moved from abaft, and begins first to turn there. If it is so, it is beyond doubting, that the force of the water is forcible behind beyond imagination, and thence adding that intention to the impulse.

V. What is the cause of the swimming of a Board or Ship upon the water?

Because the water being continuously thick coheres together and will not suffer her self to be divided, whereby they happen to be lifted up by the water.

VI. Whether all hard waterish bodies are freed from fire?

No, For although a flame is extinguishd by them, yet that hinders not, but that fire may be contained within them in particles, and close shut up between their pores; This appears in Crystal, which being smartly struck by another hard body, doth emit sparks of flaming fire from it, like unto a Flint. So neither is Ice it self bare within its pores of some small particles of fire.

CHAP. III.

Comprizing Problems touching the Air.

1. *Whether Air be weighty.*

2. *Whether a Bladder blown up with wind be heavier than when empty.*

3. *Why*

3. *Why water contained in a beer glass, being turned round with ones hand, doth turn contrary against the motion of the Glass.*
4. *Why a breath being blown with a close mouth doth feel cool, and efflated with a diducted mouth feel warm.*
5. *Why an armed point of an Arrow groweth hot in being shot through the air.*
6. *Why Beer or Wine will not run out of the Cask without opening a hole at top.*
7. *What difference there is between an Oricane and a Travada.*
8. *Whether it be true that Winds may be hired from Witches or Wizards in Iceland.*
9. *Why is it quieter in the night than in the day?*

I. **W**Hether Air be weighty?

Ans. Air considered as enjoying its Center, is light and doth not participate of any weight, since it would only move from the Center to the Circumference, and ever force extraneous bodies upwards; *Ergo* Air absolutely conceived is only light. 2. Air in its present state is also weighty (but accidentally only, and not essentially,) because of its sinking downwards towards the Center.

II. Whether a Bladder blown up with wind be heavier than when empty?

Ans. There hath been trial made of this (to wit, of the weight of a bladder blown up by Bellows at top of a high hill) in a pair of Scales, and it was found that an empty bladder weighed heavier than one filled with wind; the same is also deprehended by casting them both into the water, where we shall find the empty bladder first to be equal with the Surface of the water, and afterwards to sink down a little, whereas the windy one swimmeth at top. The cause is, by reason a bladder extended by the air within is supported by it, and being rendred more porous and subtil through its obduction the air doth easily pass without any resistance, and therefore doth not depress it so much as an empty bladder, which through its corrugation and lesser diduction is more dense, and therefore receiving the depressing force of the air much stronger, besides being more acute, is apter for to cut through the inferiour air; whereas a bladder blown up is obtuse and doth as it were swim in the air: But if a bladder be blown up with ones breath, then doubtless it will prove heavier than an empty one, because of the vaporous or heavy waterish air contained within.

III. Why

III. Why doth the water, contained in a beer glass being turned round with your hand, turn contrary against the motion of the glass; the same is observed in rousing a barrel full of water, where the liquor turns contrary against the barrel?

Ans. The water is here detained flat, or held fast by the air sinking down, whence it is, that the water seems to move against the motion of the Vessel, being glib, or slippery and smooth, and therefore not detaining the vessel in its motion.

IV. Why doth a breath being blown with a close mouth feel cool, and efflated with a diducted mouth feel warm?

Ans. Because the breath or incassated air of a close mouth is more united and longer continued, whereby it doth vigorously puff the ambient air, whose compression felt, causes cold, as I have explained it in Book 1. Part 2. Now through the union of the incassated air that is efflated, the *hot minims* of the breath are deeply and equally impressed into the substance of the vaporous air, whence their virtue is also suppressed; but in breathing of the said air out of an open mouth the fiery *minims* do come forth in troops unequally and but superficially mixt in or supported by the said incassated air, whence they abide energick; besides the air being but little puffed makes little or no compression: Hence you may also collect a reason, why the air doth refrigerate being agitated with a Fan.

V. Why doth an armed point of an Arrow grow hot in being shot through the air?

Ans. Because its body and pores are somewhat opened by the air grinding against it, whereby its fiery parts procure an occasion of being united and condensed. This doth also resolve us, why a Knife being smartly whetted emits sparks of fire; or why a Flint being struck hard against a piece of Steel doth likewise sparkle fire from it, *viz.* because its solid parts are opened and disjoyned through the concussion, whereby the fiery *minims* happen to be united and condensed. Likewise many cold bodies by being chewed or contrited do afterwards grow hot.

VI. Why will not Beer or Wine run out of the Cask without opening a hole at top?

Ans. Because of the continuous adhesion, or cohesion of the continuous parts of the liquor to the continuous parts of the Cask; but as soon as it is averuncated, divided, and impelled downwards by

by the air entring at the upper hole, it runs freely out of the Tap. That it is the air entring atop which presseth out the liquor is apparent by the cavity atop, which the fore-impulse of the air entring causeth.

VII. What difference is there between an *Oricane* and a *Travada*.

Answ. An *Oricane* is usually much more violent, and therefore also much less lasting, bursting down circularly from all parts like to a Whirlwind. A *Travada* is more lasting and less violent, and erupts directly down, from one tract, and in no wise circularly, which as it oft rages upon the Seas off the shores of *Coramandel*, *Manicongo*, *Guiny*, &c. so the former is more frequent in the West-Indian Climates.

VIII. Whether it be true, that Winds may be hired from Witches or Wizzards in *Island*?

Answ. It is certain, that the Winds blow very variously and manifold about that Island, insomuch that it is not rare to see Ships sailing several courses at once, all of them being equally favoured by a good wind. The cause of this being vulgarly not known, hath occasioned people to brand the old men and women there with Witchcraft, whom the roughness of the air may cause to look rugged like the devils correspondents, selling the winds by retail. The causes of this variety are great winds, erupting oft out of several holes of the earth about the Island, especially about the Mount *Hecla*, which many believe to be the mouth of hell, because of those prodigious thunders and murmurings of winds that are perceived thereabout.

IX. Why is it quieter in the night than in the day?

Answ. Because in the day the air being fluid and continuous is agitated into waves by the Suns fiery beams, whose bodies clashing together cause a small noise in the day, which the night season is freed of.

CHAP. IV.

Containing Problems touching the fire.

1. *Why doth water cast upon unquencht chalk or lime become boyling.*
2. *Why doth common salt make a cracking noise, when cast into the fire.*
3. *Who were the first inventers of Gunpowder.*
4. *What are the Ingredients of Gunpowder.*
5. *Whence arrives all that flaming fire, that followeth the kindling of Gunpowder.*
6. *Whence is it that Gunpowder being kindled in Guns erupts with that force and violence?*

I. **V**Hy doth water cast upon unquencht chalk or lime become boyling?

Answ. Because fire in lime is detained or imprisoned within a thick glutinous moisture, which being attenuated through the thinner moisture of water, is forced to suffer the igneous parts before dispersed and imprisoned to unite, whence being condensed and incompassed by a thin glutinous air is changed into a hidden flame, whereby the water is rendred boyling hot.

II. *Why doth common salt make a cracking noise, when cast into the fire?*

Answ. Because the flaming fire exufflating the spirituous air of the salt within its body, doth also force it to burst out, the report whereof is not unlike to a cracking noise.

III. *Who were the first inventers of Gunpowder?*

Answ. In the first place touching the dispute, whether the invention of it is to be adscribed to the *Chineses* or the *Europeans*, it is very probable, the *Chineses* were the first Authors of Gunpowder, because they were found practising upon it at the same time that it was first invented in *Europe*. Next, who was the Author of it among the *Europeans* is uncertain, but certain, that he was a German, whose name some would call *Berthold Swarts* a Monck of *Eriberg*, said to have found it out accidentally, by

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leaving a mixture of Saltpeter and Sulphur in a Mortar, covered with a stone, whereinto a spark of the candle lighting by chance, forced the stone up with no small report; from this he was also supposed to have taken the fabrick of a Gun.

IV. What are the ingredients of Gunpowder?

Ans. Its materials are ordinarily Saltpeter, Sulphur, and dust of Charcoal: All which being very igneous do very much intend one anothers force in blowing up a fire.

V. Whence arrives all that flaming fire, that followeth the kindling of Gunpowder?

Ans. The Saltpeter, which is the chiefeft of the ingredients, consisting of very weighty dense and waterish parts, contains a great proportion of fiery *minims* within its body, but dispersed through those weighty parts and suppressed by them; these being somewhat diducted and opened through the rarefying and expanding vertue of an external actual flaming fire, give occasion to the fiery *minims* interwoven with incrassated air to unite, and through the compression of the weighty parts to be condensed, whence erupting into the air doth attract other fire latent (or rather is forced to it by the accurs of the ambient air) and dispersed throughout the air, whereby its flame is much amplified and continued; for it seemeth very improbable, that so much fire should have been latent in the Gunpowder as the flame requires.

2. The dilatation of the said erupting flame is also attenuated by the accurs of the air, expanding the thick and course erupting flame gradually into a thinner larger flame; whence it is that the flame near where the Powder was kindled appears dusky red, and further off light and flashy.

VI. Whence is it, that Gunpowder being kindled in Guns erupts with that force and violence?

Ans. The Powder being kindled into a flame at the Touch-hole, divides or discontinuates the air more than any other body imaginable, whereunto the air accurs from all parts, especially from above, with the greatest velocity and force, for to expell the flame, which being propagated further, partly by its own force, partly by the intrusion of the air, causeth a more violent discontinuation of air within being pent up, whereunto again a greater power of air accedes from without and attenuates the flame within, whereby together with the compression of the sides of the Gun, and the

great

great access of air from without the flame is violently expelled, effecting a great report through its disrupting and pluffing of the air.

Here observe, 1. How the flame is augmented within the Gun; not by a virtual rarefaction, as if the parts of the Gunpowder could be augmented without access of other matter from without; for that would suppose either a *Vacuum*, and a new creation of parts, or a penetration, and an annihilation of foregoing parts. Wherefore, I say, it is augmented by attracting fire out of the acceding air; and secondly, by being attenuated and diducted into a large flame by the parts of the irrupting air.

2. That it is the air entring at the touch-hole, that doth expell the flame, is evident.

1. Because the air is shut out before by the bullet and tow.

2. The touch-hole being stopd at the next instant after the Powder begins to kindle, the flame is immediately suppressed and extinguishd, or at least bursteth up behind. Whence it doth appear, that it is the air entring doth attenuate (vulgarly termed rarefie) and expand the flame, which the advenient fire doth augment; and that the said air doth expell the flame out at the muzzel.

3. That the air doth make use of the weighty *minims* of the salt-peter in compressing and expelling the flame outwards.

4. Why is a hot glass burstd by casting a drop of cold water upon it?

Ans. Because the fiery *minims* contained within its pores are condensed and violently compressed by the gravity of the water, whereby they are forced to disrupt the glass.

Why doth a wooden Arrow, being shot out of a Gun, pierce deeper than an Iron one?

Ans. Because the wooden one gives way into it self, or shrinks as it makes a hole, whence being rendred lesser passeth the easier through: whereas an Iron one is stubborn, and is rather somewhat flatned against the body aimed at, whence being rendred more obtuse and bigger at the point, is hindred in penetrating.

Labore & constantia.

Soli Deo triump. gloria & honos in Sacula Saculorum,

AMEN.

Errata.

Page 9. line 12. dele *that*. p. 11. l. 3. read into. p. 21. l. 20. after *Pellines*, &c. must be inserted those words below, beginning l. 30. *I was much abused, &c.* ending at l. 34. at breathing. p. 35. l. 14. r. *Fire is rough*. p. 44. in marg. r. *χεν'ω fundo*. p. 135. l. 25. r. *a man couragious*. p. 144. l. 13. r. *Medicine*. p. 145. l. 28. r. *procatartick*. p. 148. l. 4. r. *its naturall*. p. 167. l. 18. r. *the lumina*. p. 170. l. 21. for *are r.* is. p. 191. l. 26. r. *Cyricum*. p. 194. l. 15. r. in oyl, for *that is a tast mixt out of a waterish and ayry tast*. The rest are intermediate, as *bitter, acerbe, acid, and salt*. p. 196. l. 12. r. *assimilation*. p. 197. l. 13. r. *Lynx*. l. 12. r. *very near*. p. 198. l. 5. r. *Fish*. l. 9. r. *do*. l. 20. r. *A Cat is delighted*. p. 230. l. 21. r. *An Opale*. p. 238. l. 19. r. *White Chalck*. p. 330. l. 6. 9. r. *rise*. p. 331. l. 36. r. *Perinean*. p. 343. l. 31. r. *within*. p. 350. l. 16. r. *River*. p. 363. l. 23. r. 28. p. 398. l. 34. r. *deib*.

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